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CANADA

Teaching yourself in primary school

Report of a seminar on self-instructional programs

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Preface

This document presents research and development efforts in self-instructional programs being undertaken in six countries. A 4-day seminar, sponsored by the International Development Research Centre (IDRC) and generously hosted by the Institut national de la recherche scientifique (INRS) of the University of Quebec, gathered research specialists, project directors, and representatives of IDRC. The meeting provided a forum for the exchange of findings and views about the implementation of and research on self-teaching programs conducted in the Philippines, Malaysia, Indonesia, Jamaica, Liberia, and Canada. The participants found the meeting enlightening: it was the first time that they — as implementers of similar innovations — could learn, first-hand, about each other's experiences, problems, and solutions.

Because the papers discussed at this seminar carry a potential usefulness for other persons interested in school change and renewal, IDRC sees it as proper to disseminate them in a single report. We thank each of the contributors to this document, and in particular Amy Chouinard of the Communications Division for her technical editing.

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Foreword

The seminar on self-instruction in primary education brought together from different parts of the world people who have been intimately involved for several years in primary level self-instruction projects, either in their actual implementation or as representatives of funding organizations.

The main purpose of the seminar was to draw on the experience of research and development efforts in the self-instruction field in a great variety of settings as a basis for future research and application. It was also a means of trying to determine the present activity in the field. As well as taking part in the discussions, each participant gave a report on some important aspect of the project in which he or she is involved. The reports are reproduced in these pages along with a distillation of the priorities and issues resulting from the discussions.

The attempt to implant a new way of teaching at the primary level is a many-sided adventure drawing its dynamics and its component parts from several disciplines and therefore — as all the participants testified — obliged to take into account all kinds of restrictions and regulations to which these disciplines are subject.

First, in any project of this nature, there is the *pedagogical activity* carried out within the requirements of the school curriculum and involving many actors — students, teachers, parents, national and local education authorities, and support personnel, all of whom must coordinate their activities and meet people's expectations. It is also an *innovation*, producing social change in a given educational setting. This requires preparation of the people, testing in a real situation, and sustained attention because roles are modified and different physical and human supports are introduced that must respect the rate of evolution in the local community. Coupled with these considerations is the redefinition of curriculum and production of self-instructional material, which raises such practical questions as the design of the material, its printing, and distribution.

There is one other indispensable aspect to be considered — research, which both clarifies and complicates the undertaking. It is essential, for purposes of evaluation, to those actually running the operation. It is equally necessary as a means to obtain the approval required from national authorities, funding agencies, or promoters. The field of research and evaluation design is exacting; it demands that painful choices be made between the desirable and the possible and that the credibility of the enterprise and its researchers be maintained in the eyes of the scientific community and society at large. Over and above the evaluation itself, such undertakings provide prime material, and plenty

of it, for the type of research that purely and simply advances the state of knowledge in the field.

These issues were obviously not all treated in detail by the Quebec seminar, but, as a reading of its proceedings shows, they served as a background to the deliberations and quickly provided the participants with some common ground despite geographical and cultural differences. In a spirit of friendship we tried to define some of the framework, especially in the area of research and evaluation. It remains for me to express the wish that others, stimulated by projects like Impact and SAGE, will be able to turn the results of our discussions to advantage.

In closing, I wish to take this opportunity to thank all the participants for their significant contributions to the work of the seminar, particularly IDRC, which, besides making the meeting financially possible, contributed greatly through the energy of its team. We at INRS, a research centre of the University of Quebec, are emphasizing research and development of self-teaching programs and have observed the application in classrooms, since 1973. We especially enjoyed the chance to exchange experience with those from other countries in the world.

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Introduction

In Malaysia, nearly 100% of primary school age children are enrolled in classes. Upgrading the education they receive is Project Inspire's goal.

Research and Development Activities in Primary Schools

In the middle and late 1970s, IDRC funded no fewer than four national experiments in self-instructional technologies at the primary school level (Table 1). The first two were in 1974 in the Philippines and Indonesia with Project Impact and Pamong. These were followed in 1978 and 1979 by similar projects in Malaysia (Inspire) and Jamaica (Primer). Meanwhile in Canada in 1973 the Institut national de la recherche scientifique (INRS) in Quebec was independently developing a very similar experiment in self-instructional primary education, Project SAGE (Système d'apprentissage géré par l'étudiant). A few years later, at the very beginning of the 1980s, AID (U.S. Agency for International Development) began assisting the Liberian government to replicate elements of the Impact system in a program of improved efficiency of learning (IEL), and, with World Bank aid, Bangladesh started, as part of the Sector Loan for Education, to experiment with a similar mix of components.

The planning that eventually led to Impact and Pamong goes back to 1971. A historical account of Project Impact — *Educational Innovation in the Philippines* — was written by Pedro Flores and is available from IDRC (IDRC-TS36e). It is perhaps appropriate to review some of the research aspects of the years since the early projects' inception. One rationale for doing so is that the projects now straddle all the different stages of development. Those in the Philippines, Indonesia, and Canada have completed their pilot phases and have started wider replication in their respective provinces, regions, or school boards. In Malaysia and Jamaica, by contrast, the new instructional materials are just beginning to move into the experimental schools. Meanwhile, Liberia and Bangladesh are only commencing the stage of curriculum development. Insights from the earliest experiments could benefit the more recent projects, and, as a corollary, data that the early projects had neglected, or had been unable, to collect through pressures of program implementation could be acquired in a slightly different form from the recent projects.

RESEARCH VERSUS DEVELOPMENT

Although it is common to talk of R *and* D, it is important in a set of projects like this to recognize an almost inevitable tension between the

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Table 1. Overview of self-instruction experiments in the Philippines, Indonesia, Malaysia, Jamaica, Liberia, and Canada.

Project name/ country	Year started/ initial experimental schools	Grade levels/ subjects covered	Instructional media used[a]	Products developed	Stage of development (as of June 1981)	Donor/ coordinating agency[b]
Impact — **P**hilippines **I**nstructional **M**anagement by **P**arents, **C**ommunity and **T**eachers	1974; 5 rural schools	Entire primary grades; almost all subjects	Programed teaching; self-learning; peer-group learning	Programed teaching guides; curriculum guides; self-instructional management guides	Expanded tryout of the system by various regions of the country (33 schools)	IDRC; SEAMEO-Innotech; Ministry of Education
Pamong — Indonesia **P**endidikan **A**nak oleh **M**asyarakat, **O**rang tua Murid, dan **G**uro (Indonesian translation of words making up Impact)	1974; 4 rural schools	Entire primary grades; almost all subjects; primary school dropouts	Programed teaching; self-learning; peer-group learning	Programed teaching guides; self-instructional modules; tutors' guides; management guides	Expanded tryout in Bali, Java, Kalimantan, and Sulawesi	IDRC; SEAMEO-Innotech; BP3K; AID
Inspire — Malaysia **I**ntegrated **S**ystem of **P**rogramed **I**nstruction for **R**ural **E**nvironment	1978; 6 rural schools	Grades 1-3; all subjects	Programed teaching (teacher-mediated)	Programed teaching guides	Experimentation in 15 schools (grades 1 and 2); materials for grade 3 being developed	IDRC; Ministry of Education; Universiti Sains Malaysia

Primer — Jamaica **P**roject for **R**eshaping and **I**mproving **M**anagement of **E**ducational **R**esources	1979; 5 rural schools	Grades 1-6; English and mathematics	Programed teaching; peer-group learning; self-learning	Integrated continuum curriculum; self-instructional modules; teachers' guides	Experimentation in grades 1, 2, 4	IDRC; Ministry of Education; Youth and Sports
IEL — Liberia **I**mproved **E**fficiency of **L**earning	1979; 10 rural schools	Grades 1-6; all subjects	Programed teaching, grades 1-3; self-learning, 4-6	Self-instructional modules; programed teaching guides	Experimentation in grades 1-3	AID; Ministry of Education
SAGE — Canada **S**ystème d'**A**pprentissage **G**éré l'**É**tudiant	1974; 2 urban schools	Grades 4-6; English, French, mathematics	Self-learning with printed materials, tape recorders, slides	Teaching-learning units including evaluation for students and teachers (guides)	Dissemination for grades 4, 5, 6. (24 schools)	Institut national de la recherche scientifique (INRS); Canada Council; Secretary of State (Canada); Ministry of Education of Quebec

[a]Programed teaching is instruction done by a trained teacher (teacher-mediated) or a trained older pupil using programed teaching guides; self-learning is learning by self-instructional modules (module-mediated); and peer-group learning is small-group learning among pupils of the same grade level (peer-mediated) using self-instructional materials.

[b]SEAMEO = Southeast Asian Ministers of Education Organization; Innotech = Center for Educational Innovations and Technology (one of the regional centres of SEAMEO); BP3K = Office of Research and Development for Education and Culture; IDRC = International Development Research Centre (Canada); AID = United States Agency for International Development.

research and development activities of each program. In large curriculum-development projects, converting the primary school subjects into carefully sequenced modular instruction for the children (or for the teachers, in the case of Malaysia) is an extremely labour-intensive endeavour. Teams of writers have to be assembled, trained, motivated. Pilot testing has to be arranged in schools that are agreeable to the innovation; once materials begin to be distributed, the project gets locked into a series of deadlines and delivery dates for the new modules, as term succeeds term, and the project is extended through other grades in the school system.

It is a situation inimical to research and reflection. Careful calculation of the impact of the new is frequently subordinated to the all-consuming process of program management and implementation. The project leader is talked of loosely as principal researcher as if he or she is similar to an investigator in any other research project. Nothing could be further from the truth. In evaluation research, for example, the investigator assessing the influence of some innovation or other can quietly develop appropriate instruments, apply them and any other measures to the situation under analysis, and then proceed to reflect on the accumulated data. In development projects, by contrast, the team leader is obliged to be a mixture of personnel manager, animateur, local politician, and priest as well as researcher.

Contrary to the traditional view that research parallels the development activities and that in due course research results are conveyed to ministries for policy decisions, the real process of dissemination begins on day 1. If ministries, teachers unions, and local bureaucracies are not incorporated early, and if contacts are not maintained as ministers and their advisers rise and fall, the project may not long outlive the end of its foreign funding. The development research leader is only too aware that research results are only one of the many balls he or she is trying to keep in the air at the same time; indeed it can frequently be dropped without anyone noticing. Not so the module production line or the morale of teachers in the pilot schools. If the children or teachers vote with their feet from the pilot schools, the project is finished overnight.

The many implications of this tension between development and research need to be recognized.

The Timing of Research in a Developmental Research Project

The problem is principally that organizing rigorous evaluation research or quasiexperimental conditions is difficult at the time the project is being put into place. This is not to deny that other kinds of research are being employed inevitably in the very process of curriculum development. These, however, are types of instrumental research, inherent in the selection of the modular system, and the sequencing and ordering of the myriad parts of the new curriculum.

The projects really require to be fully operational before it is appropriate to mount an investigation of their effectiveness with evaluation or quasiexperimental research. Only too often, however, funding agencies demand an evaluation of their projects while they are still settling down. There are certainly some kinds of data that do need to be collected from the very early days of the intervention, but fre-

quently the attempt to produce a whole apparatus of control and experimental schools from the commencement of the research can be misguided. It could be argued instead that educational development projects need to be protected from the exercise of experimental conditions in their first few years. In particular, they need to be protected from the view that in year 2 or 3 a single achievement test between the control and experimental schools can determine whether the project has "succeeded."

Now, 7 or 8 years after the first projects started, there are some extremely fascinating research questions that need to be tested in the Impact and Pamong schools. They probably could not have been investigated much earlier. But now that in the original sites, the projects have achieved a degree of local ordinariness, elements of the system can be compared and contrasted with practices in nearby schools without much fear of contamination or bias.

Whereas 7 or 8 years may seem too long to wait, given that primary school lasts 6–7 years, it may almost be too short. The first children to have been affected by the experiment from grade one are just leaving school and entering the secondary level of education; this move may well be the first real test of an alternative primary school system. The reality in far too many projects and curricular initiatives is that the enterprise has been abandoned and replaced by another model long before one cohort of children has completed a single cycle.

Two-Year versus Ten-Year Projects

A full development and research cycle is likely to be nearly 10 years in a curriculum innovation of the Impact type. But research projects tend to be funded for only 1–3 years; it is consequently difficult to argue for anything approaching the length of support needed satisfactorily to reach the end of the final research phase. As the costs for the development phase of any educational project continue to escalate, so it becomes difficult for foundations and research funding agencies to support the whole cycle. The tendency is for research funds then to go toward only the evaluation phase of the larger agencies' projects. Researchers find themselves evaluating, often on a consultancy basis, projects over whose development they had no say and, perhaps, no interest. In this dichotomy between development project and evaluation activity, the researcher turns consultant and frequently reviews in a few months projects whose detailed historical development is lost to research.

In the Impact and Pamong projects, by contrast, some of the individuals earlier involved in the development of the sites are only now producing research on the systems with which they have been associated. Haris Mudjiman has been investigating the effectiveness of the peer-tutoring system as one of the elements in the Indonesian experiment. But he has done it at a point when the Pamong schools have moved from experimental to ordinary primary schools. Similarly, Rosetta Mante has sought to capture through a tracer study of Impact school leavers, the difference their early experience made when they reached secondary schools. Third, there is the historical analysis of Pedro Flores.

Experimentation and Ordinariness

I have suggested that, despite the importance of long-term commitment to a research activity, pressure to demonstrate the workability of the intervention frequently comes quite early from the funding agency, from the government, and often from the researchers themselves. Controlled situations are arranged and baseline data collected to demonstrate at some critical point in the project a comparison between the pilot and control schools. There have been some ingenious attempts in the present group of projects to work with control schools. But the leaders have agreed that it is often difficult to ensure a fair comparison. Should they tell the control schools what they are? "No," says Malaysia, "the control schools will then try extra hard to prove that they are better than the experimental schools." "Yes," said Jamaica, but found that in one case many control schoolchildren began to transfer and enroll in the experimental schools; thus the intended control school no longer functioned as a true control.

Occasionally, there is interference with the experimental schools, as in the Philippines, when in the early years local jealousies led officials to offer Impact teachers better jobs "down the line," i.e., nearer to the city, in the hope that the experiment would be weakened.

Quite apart from these local incidents, the real methodological problem with such experiments is that publicity pours on the experimental schools. In these experiments, the entire curriculum was being reorganized, the structure of the school altered to allow for small group work outside the classrooms, and the teachers being given much greater responsibility in quite different circumstances. As all the projects except SAGE in Canada were externally funded, there was a stream of foreign professional visitors from the donor agencies, as well as educationalists anxious to see whether self-instruction and the use of older children as teachers allowed Impact to achieve a dramatically different student-teacher ratio. In a situation where the ordinary local schools may seldom see an inspector, let alone a foreign adviser, it becomes difficult to create conditions for a genuine comparison. (In an attempt to reduce this particular inequity, the Malaysian researchers intend to visit their control as often as their experimental schools.)

Usually the critical assessment of success takes place when the foreign funding is still operational and before the experiment has been localized. Too often, also, the comparison is dependent on a single test of pupil achievement. This may well be all the proof that a ministry can digest, but it offers a very narrow angle for examining the variety of change in schools, teachers, and individual classrooms. Now, when the older experiment sites in Canada, the Philippines, and Indonesia have become quite accepted and ordinary in the eyes of children and parents, is a much more appropriate moment to assess the total system at work.

Cumulative Research on Self-Instruction

Not only are the seven different projects at different stages of development, but they are employing somewhat different mixes of modularization, self-instruction, peer teaching, and pupil teaching. There is, nevertheless, a sufficiently common core for it to be worthwhile

collecting and sharing information about their development and research experience. A staggered informal network of this kind can profit from the insights and analysis of each group. By no means is it only a matter of the younger projects' learning from the old, but, as evaluation methods have changed during the 7 or 8 years, it is also a matter of the older projects' planning to apply research questions to their now ordinary sites that were never considered worth asking during their development.

For example, the main lines of concern in projects Impact and Pamong were to measure cost and efficiency. Yet, the unintended consequence of a system that gives children considerable control over the organization and execution of their own learning may be that children gain a degree of independence and self-sufficiency that may be very important in home study, later learning, or following the myriad types of written instruction associated with modern life. One of the important but, as yet, unmonitored aspects of most of these projects may be that learning is enjoyable. Unlike the structured ranks of many upper primary school classes, children can learn with their friends and switch to a new subject when they need to without waiting for the whole class. "It's fun," admit Quebec children quite openly.

Perhaps a different approach from the classical apparatus of baseline survey, pretest, and posttest of educational achievement is needed. One cannot just add some test of attitudinal change either. Rather, what is needed is a means for the steady accumulation of information and evidence that will allow one to answer questions about the influence of the project. For example, what are the changing attitudes of teachers to a system that makes them intermittent advisers to individual children on problems that are no longer all taken from the same lesson or the same two pages? Do they really get more time for working with slow learners or difficult children, or do the brighter children continue in self-instruction as in teacher instruction to dominate the teachers' attention? What is the situation 8 years after the first projects began? Has the pattern of teacher mobility been as marked in Pamong, Impact, and SAGE schools as in traditional schools? Have teachers, after a year or so in the new system, gone back to traditional classrooms? In Impact's Naga sites the present teachers appear to have stayed for long periods, several for 6–7 years. Detailed interviews might reveal a whole layer of the impact that at present we barely understand.

Parental feedback is another vital research concern. To what extent, for example, can parents participate more usefully in homework when they can see from the modules exactly what is being taught and no longer run the risk of helping their children by a technique in writing or arithmetic that is different from what is used in schools today?

Modular instruction may suit some school subjects better than others. In particular, there may be reason to believe that math requires a greater degree of teacher explanation and advice than language, social studies, etc. Rosetta Mante has mentioned in a personal communication that whenever she visited her several schools, she had the distinct impression that teachers were advising individual students in math. No research was done on this, but evidence collected on requests for teachers' help might be a good introduction to examining what subjects

can be largely acquired through self-instruction and which need a stronger mix of formal explanation by the teacher.

One outcome of the attempt historically to accumulate evidence on particular schools could be monographs on an individual school in the Philippines, Jamaica, or Canada. To some extent, such individual exemplars of the system in action can be done retrospectively, especially as there has been teacher continuity in many cases and the location of expupils presents no particular research problem. A case study of this sort could be of considerable value to teachers in newer sites in the same country, as well as in replication of the project nationally.

Development projects are much more visible than research projects. Consequently, the maintenance and replication of a development project represent a much more political issue than does the dissemination of research. If a ministry of education or a regional education office decides against replication or against maintenance of the original sites, the impact is vastly different from a ministry's reactions to a research report. Closing down a development project after the end of external funding is not uncommon and is frequently an indication of how far the project had become adopted by the local and national officials during its development phase. Because the decision to maintain or drop a development project is qualitatively different from reacting to research results, it is no wonder that research issues initially take second place in development projects.

I have argued here that the tension is inevitable between the two and have also suggested that the classic control-group research linked to pre- and posttests is not necessarily the most appropriate way to accumulate evidence on development projects.

There are many alternatives available that perhaps over the long run will produce richer data or evidence with which to interpret more satisfactorily the results of a single achievement test. But in almost all cases the alternative methods are much more labour-intensive than is the one-shot pre- and posttest. As the project leader cannot devote more than a fraction of his or her time to research, it is essential to build into the project a full-time researcher, responsible for coordinating with the principals and teachers the institutionalization of the research. If research can be built into the new system in ways that monitor peer groups, types of teacher remediations, etc., then it can provide information for improvement on a school-by-school basis as well as accumulating the material needed for a more systematic study later on. At the moment, there is still a tendency to view research as a series of (happily) brief incursions by outsiders into the school system. It should more appropriately be seen as a form of participant monitoring of the system from within. Ideally, the person (researcher) responsible stays in the field sites and does a research apprenticeship as a teacher in the system for 2–3 months beforehand.

In the case of these seven projects, in addition, there would now be value in arranging some way whereby one person could for a period be appointed as a broker or circuit rider to disseminate information from site to site and to help in securing attention to the interactive potential of research, development, and dissemination.

Self-Teaching Programs: A New Technology and a New Philosophy

One of the most potent technological developments to hit the classroom has been self-teaching materials. Although educational technology is commonly understood in terms of machines (computers, audiovisual equipment, calculators, TV, videotapes, etc.), it also refers to the management of knowledge, procedures, and people in the instructional process. Materials that instruct students directly by leading them into a sequenced acquisition of knowledge constitute a profound challenge to the status quo of the classroom, especially two key traditional components: teachers and textbooks.

To be effective as a new technological tool, self-instructional materials need to be both better than and different from textbooks. Self-teaching materials must contain specific learning objectives, concrete and clear learning activities for the student, provision for assessment, continuity of learning, and remediation. Moreover, each module or unit must be designed so it possesses some intrinsic complete coverage of the objective selected. It is natural, therefore, for implementers of self-teaching programs to devote much time and effort to the development of self-instructional materials and, later, to see them as the main element in their new programs.

Materials that instruct students directly and bite-sized modules or units that allow students to proceed at different speeds are more than a new technology. They are intimately connected to a new philosophy of education — a philosophy that creates different roles for students and teachers.

The philosophy to which I refer is not as new as the technology that permits it to be implemented. In historical terms, this philosophy emerged more than 60 years ago in the United States. Some of its basic premises can be traced to the John Dewey school that rejected drills, the concept of uniform group progress, and standard one-time-only tests to determine student success or failure in learning. The Dewey school, demanded more student participation in class activities, with subjects meaningful to the child, and a classroom discipline based on self-expression and self-reliance.

Although these ideas were welcomed by many teachers and citizens, it took a long time to make them operational. It was not until the mid-1930s that schools tied to the so-called Progressive Movement emerged, mostly in Illinois and other midwestern states.

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The Progressive Movement was characterized by two key notions: one about learning and the other about democratic organization. The first was a testable proposition; the second was not — it was a statement of personal belief and preference.

The Progressive Movement viewed learning as self-initiated, depending highly on individual motivation and thus likely reflecting individual differences in rates of growth and achievement. The new approach in learning rejected the notion of age-based learning, a single curriculum, emphasis on memorization, and the separation of work and play. It acknowledged that chronological and mental age do not always correspond and that it is possible for individuals to excel in one subject matter and have difficulties in another. Moreover, it wanted individual differences recognized not by the elimination of students but rather by the progression of students at different paces.

The Progressive Movement questioned the overwhelming authority of the teacher and teacher-centred instruction. The new philosophy — to paraphrase Dewey — did not view the teacher as a dictator of a miniature society but as a guide, a planner, a psychologist, and a resource person. According to this perspective, the student is an active participant, and other individuals — community volunteers, teacher aides, and peer tutors — also have a role in the classroom.

The emergence of self-instructional materials in the 1960s made a major contribution to the implementation of the Progressive Movement philosophy in the classroom. The research on conditioning by B.F. Skinner (early 1950s) gave rise to self-teaching materials based on linear programing. The contribution by N.A. Crowder (1959) later produced self-teaching materials based on the branching programs. Much debate arose on whether students learn more when presented materials in small and precise sequences that constantly test them on their correct understanding (the linear programing approach) or when given a sequence of materials that allow them to examine both correct and incorrect responses (the branching program approach). While this debate is far from being empirically settled, the fact is that self-teaching materials have entered the classroom in significant amounts.

Today, there are many models of nontraditional education. It is variously known as nongraded, multigraded, continuous progress, split level, family grouping, and individualized instruction. Some of these labels describe the organization, others the instructional methodology used, and yet others refer to the materials of instruction. What these programs have in common is student initiative in learning activities, no repetition of grades, little rote learning, and allowances for differential pace.

Individualization ranges from the infrequent case in which each student has an individual plan of studies with specific day-to-day lessons tailored to his or her particular needs to the much more common "differentiated" pacing of instruction, in which the goals of instruction and materials are the same for all students but where the students move along their common track at different rates of speed depending on their abilities and motivation.

The variety of labels that schools have used to describe their programs and the innumerable adaptations they have made within

these programs render it difficult to assess how widespread nontraditional education actually is. A series of longitudinal surveys of U.S. school principals on the application of individualized and flexible instructional practices revealed their use by 6% in 1956, by 12% in 1961, and by 26% in 1966 (Miller 1967). At present, there are no precise data about the utilization of programed materials and individualized instruction, although it is known that these innovations are used mainly in primary schools and that, in North America, they were more popular during the 1960s than in the late 1970s.

Nontraditional education is practiced in Canada, England, and several other European nations. Little is known about the spread of self-instructional programs in developing countries, except perhaps for the cases reported elsewhere in this book, which reflect a greater application in Asia than in other areas of the Third World.

A Complex Innovation

A major reason for considering self-instructional programs both as a technology and as a new philosophy of education is that they represent a complex innovation. They affect all six major organizational components of the school: instruction, curriculum, student grouping, staffing patterns, scheduling, and facility design. Moreover, they drastically change the teacher's role.

Self-teaching instruction transfers the source of learning from the teacher to the printed word; also, it switches the student from the role of recipient to one that actively checks upon his or her own understanding. Curriculum is affected because, as self-teaching materials are developed, it becomes clear that much of the official and traditional curriculum is repetitious and quite often unrealistically comprehensive.

Student grouping is affected because bite-sized materials result in individualized instruction, and small groups tend to form and re-form continually as different rates of growth become apparent or as remediation has to be provided to students that do not make sufficient progress. Staffing patterns are changed because it is no longer a teacher–student organization, but usually one in which community members, peer tutors, or older tutors are also in the classroom helping in the learning process. In certain cases, a nonteaching staffing category is also created, as in the case of aides to maintain self-instructional materials in good order and in appropriate quantities.

Scheduling under self-instructional programs also changes. The 1-hour and half-hour blocks of time receive less emphasis as both students and teachers look for longer periods of learning activity that allow completion and better management of the learning modules. Finally, facility design is eventually affected because desks must be movable to accommodate changing groups, areas must be allotted for learning modules' storage and retrieval, and larger spaces have to be created to allow either learning centres or independent, small working groups (Duane 1973; Charles 1980).

Students in the early grades adapt easily to the new learning environment. The change is not as facile for teachers. Self-learning

instruction requires teachers to become good observers and managers. They need to circulate among students to observe progress and to realize who needs help. They have to devise ways to provide attention and support to those who need it in a timely and fair manner. Teachers must also provide additional activities for those students who advance rapidly and complete their modules before the academic year is ended. Self-teaching instruction requires teachers to evaluate student progress in a different way. They can no longer depend on monthly or quarterly group tests; rather, they must monitor the rate of success attained in the modules and assess progress by the speed with which students are going through the modules. Lastly, self-instruction forces the teachers into a new relationship with their students and even with the students' parents through discussions of student performance.

Modules and programed textbooks as a new technology change the teacher's role but do not make it less important. The teacher's role is no longer that of an authoritarian giver of knowledge. He or she must be very familiar with the self-instructional materials to know when to intervene. Proper training of teachers to use the new methods is essential. Without it, student learning could become a very frustrating and, perhaps, more seriously, a very lonely experience. Teachers have to be socialized into a new role and into a new concept of education.

In short, self-instructional programs affect so many components of the school system that they cannot be introduced solely as a new tool; they need to be tied to a new educational philosophy, and all the personnel using them — teachers particularly — must share new attitudes and beliefs about learning.

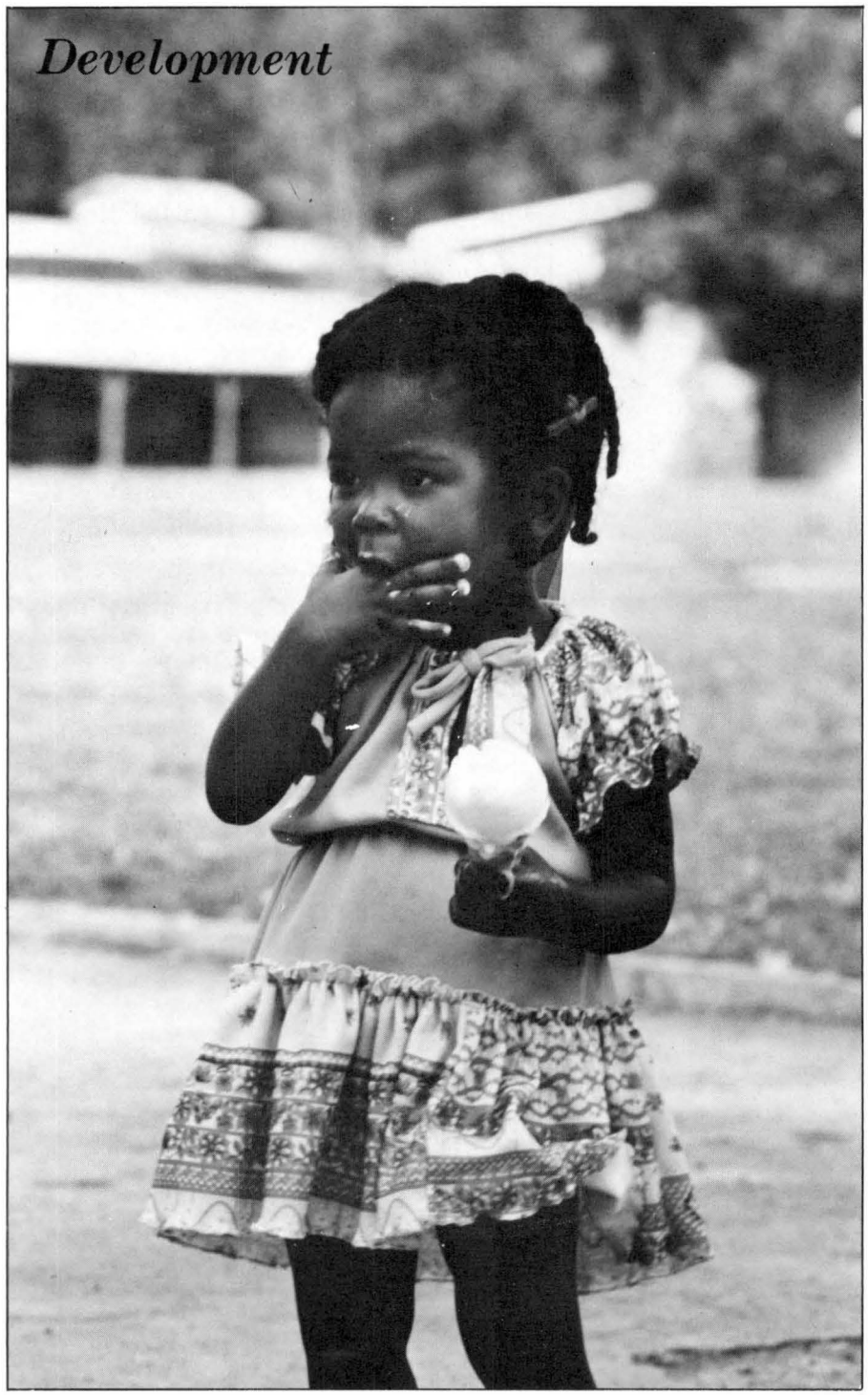
THE PROMISE OF THE INNOVATION

Self-instructional programs in the developing countries are being advocated as a means of reducing educational costs by obviating teachers, improving cognitive outcomes by bypassing poor teachers, permitting mass education by serving many more students at one time, and reducing waste by decreasing dropout rates. Although these objectives are desirable and ambitious, they are inappropriate measures of this educational innovation. First, they are not inherent to self-teaching programs, which, to my knowledge, have never been causally linked with the disappearance of a major educational problem. Second, they are often a response to social and economic pressures rather than being attainable goals. Finally, in a way, they condemn the innovation to failure, for they are generally unattainable, at least in the short term.

Among the promises of the innovation for students, cognitive growth has received the most emphasis. Students in self-teaching programs are expected to show greater gains in the basic skills than are students in traditional classes. This expectation is sensible but incomplete. Cognitive growth, long related to the acquisition of factual knowledge, is only one possible outcome. Other outcomes of equal importance are increases in leadership, creativity, independent thinking, self-esteem, and cooperation. Another is that schooling may become a more exciting experience. Programs that do not examine these outcomes are short-changing themselves.

In fact, program implementers should be aware that self-instructional programs do not always create greater cognitive learning. A review of programed instruction by the Rand Corporation (Averch et al. 1972:68) concluded that this type of instruction "is about as effective as conventional programs when student achievement is used as the criterion, but its superiority has not been affirmed." Research findings discussed at this seminar parallel the Rand conclusion. Evidence from the SAGE, Impact, and Pamong projects indicates that students in self-instructional programs performed as well as those in traditional programs. Less rigid evidence, coming from school practitioners, suggests that self-instructional programs increase individual variance in learning. Reporting on findings accumulated through several years with individualized instruction, the research director of one of the largest U.S. school districts noted (EEPA Interview 1981:77): "The rich (the good students) became richer, the poor became poorer and the mean stayed where it was."

Self-instructional programs cannot act as panaceas for the many weaknesses in the present educational system. They do, however, offer a tremendous opportunity to change the system given the many school components that their implementation affects. Program implementers will want to test whether in fact the range of expected student outcomes is as large and strong as predicted. Other assumptions, however, such as the need for a less teacher-centred classroom, the belief students should be active participants in the classroom, and the positive value of increased individual differences are not testable propositions but rather philosophical positions.



Project Primer aims to make the future for this child as palatable as the present.

Adaptation of Impact's Instructional and Training Methods in Primer

In August 1962, when Jamaica gained full political independence, the government recognized that education must be a key national development policy. And so, in the early postindependence years, considerable efforts were made to define Jamaican educational goals and to develop a well-planned, cohesive, and integrated educational system that would be responsive to the needs and aspirations of the new nation. But numerous problems and constraints hindered progress toward the development of such a system.

In 1973, a major study of the total system was undertaken to make a systematic analysis of the problems and to provide a basis for alternative and corrective measures. The report, published as the *Jamaica Education Sector Survey* stated: "The problems at the primary level are demonstratably the most acute of all the various levels of the education system."

At the same time, planners, educators, and the public were expressing their concern at the low level of academic performance among primary school graduates. The reported 53% illiteracy among these graduates could no longer be tolerated.

The policymakers responded. Although the needed reforms at other levels of the system would not be ignored, the delivery of quality education at the primary level would be a first priority. The problems that had been identified were many. Among those brought into sharp focus were:

- The inadequate provision of instructional materials and aids to support the revised curriculum. For teachers and pupils alike, there was the need for reference, resource, and nontraditional educational materials, but inadequate finances limited the creation and production of these.
- The significant number of uncertified (pretrained) teachers in the system. The concern was, naturally, for the quality of the education — its content, the methods used for both teaching and learning, the techniques and tools used for evaluation by persons "not trained to accepted pedagogical standards."
- The dysfunctional system of assessment and evaluation of pupils. The system was virtually useless in providing the kind of ongoing assessment that identifies the needs, achievements, aptitudes, or interests of the individual. Besides, the systematic evaluation of programs and materials was almost nonexistent.

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- The poor physical facilities. School buildings were often unsightly and uncomfortable. The school plan could be a hindrance to the child's learning process; it could act as a deterrent to the recruitment and maintenance of good teachers.
- The irregularity of attendance of the pupils. Some studies had shown that, of the 6 years provided for primary education, some pupils got 3 years only. This was due to late registration, frequent absences, dropping out, or a combination of all these.

In 1977, the Jamaican government's attention was drawn to an experimental project in the Philippines, Project Impact, which, with nontraditional methods, seemed to have found solutions to the problems affecting primary education in that country: problems not dissimilar to those being experienced in Jamaica. Could the Impact model be as successful in another setting and another culture? For a country in search of solutions, it was worth a try; thus, Primer (project for reshaping and improving the management of educational resources) came into being.

Adaptation Not Replication

Reports on the project indicated that Impact had put into place an instructional management system that was both effective and efficient. It seemed that effectiveness, as evidenced by improved pupil performance, had resulted from the measure of control of the quality of the curriculum offerings: control of the curriculum content; control of the teaching-learning process; control of the evaluation tools and techniques to be used; control of the record-keeping and reporting activities.

By contrast, the practices in the Jamaican system seemed to leave too much to chance. Once the instructional objectives for a grade level had been determined by the subject specialists, there was no control of the way in which the objectives were interpreted from class to class, from school to school, from parish to parish.

No one outside the particular school really knew what kind of learning experiences the pupils were having from day to day, from week to week, from term to term or how and when the development and performance of the pupils were being assessed. How were the results recorded and how were the records used? Who could guarantee effective primary education?

Because Impact was demonstrating that effectiveness could be guaranteed, Jamaica would look closely at that model — its strategies and activities — to determine whether it could be used with similar results in its system. And what of the efficiency of the Impact system? Reportedly, effectiveness had been achieved at a much reduced cost.

In Jamaica, with the exception of the Ministry of Finance, the highest allocation in the budget usually goes to the Ministry of Education, and over the years, increasing budgetary emphasis has been given to education and human resources. Yet, inadequate financing has remained one of the major constraints in the effort to provide quality education at any level. Could the Impact model provide a solution in this area, too? Educators, planners, and policymakers wanted to know.

As a first step, a study was made of the ways by which reduction in cost had been achieved by the Impact system; the analysis showed that the main thrust for reduced costs came from efforts to decrease the numbers of teachers per student because teachers' salaries accounted for the lion's share of financing.

This was not considered an acceptable solution in the Jamaican situation: not by the teachers themselves, speaking as with one voice, through their powerful teachers' association; not by the social workers and guidance counselors who were already bemoaning the scant adult attention that the individual got in a class where there was one teacher for an average 45–50 pupils; not by the economists and national planners who would have to deal with the problem of further unemployment in the society, especially among persons who had been trained for a specific profession at government's expense; not by the parents, guardians, and other community members, who had over the years relied on the teachers in the schools for guidance and leadership in the building of their communities: Efficiency would therefore have to be measured, not in terms of reduced expenditure, but in terms of reduced waste.

When a curriculum is developed, but not adequately supported by appropriate and sufficient instructional materials and aids, there is waste. When materials are provided, but not accessible to pupils, or where there is no provision for proper storage, there is waste. When teachers are not adequately trained to interpret the curriculum and to use and create learning materials, there is waste. When there is a system of testing and evaluation that is not directly related to the instructional objectives set out in the curriculum and that effectively destroys a child's self-confidence, there is waste.

When a significant number of the pupils who are enrolled in an institution fail to attend or attend so irregularly that they learn very little from the planned programs, there is waste. The cumulative waste throughout the primary grades leads to further waste at the secondary level, where time and effort must be expended to deal with the inherited deficiencies.

Project Primer, therefore, aims at putting in place an instructional management system that is efficient, i.e., reduces significantly the waste at the primary level. To accomplish this, the project adapts some of the teaching-learning methods of Impact because these have the potential for achieving real gains in the pupils' academic and attitudinal development. In particular, Primer would experiment with programed teaching for students in the early grades of primary school and with modular learning for individuals and small groups in the upper primary grades.

Programed Teaching

The literature that was made available to the Jamaican planners gave the following information about the use of programed teaching in the Impact System:

- Beginning students learn with the help of older primary students who are trained to teach specific lessons. These older students are called "programed teachers."

- The lessons taught by these programed teachers are in language and mathematics.
- A programed teaching group is made up of 6-10 pupils.
- This is the principal mode of teaching for the first and second grades and for a part of the third grade; half a day each week is taken by an itinerant teacher for extracurricular activities such as music, scouting, physical education.

This was the method to be used to achieve early literacy, the term early meaning by the end of the third grade. And early literacy was essential to the experiment, as later learning depends on the pupils' reading ability.

Teaching functional literacy and numeracy should not be based exclusively on the three Rs; an integrated curriculum must ensure the use of experiences from a wide range of subject areas to reinforce the understanding of language and number concepts. Related activities must contribute to the development of many other communication and study skills — all critical for further learning and for the child's total development.

There are some instances where whole-class teaching-learning is desirable and should be encouraged. In these situations the leader might be a teacher, an older pupil, or a member of the class.

There are some skills, for example the skills of critical thinking and of decision-making, that can only be developed in open-ended situations where, usually, there are no absolutely right and no absolutely wrong answers. In these situations, there is the need for a moderator — a teacher or other "significant" adult — willing to accept each pupil's response and to stimulate further thinking.

Other skills can only be learned by extensive practice. Here, individual or small-group activity is essential. Here, too, adequate learning materials must be available to meet the various needs of the individuals or groups. The help of older pupils is valuable to monitor the processes. The teacher can be assured that what has been planned is being implemented if the content is part of a specific program and if the older pupils are specifically trained or "programed" to work as "teachers."

It was agreed that at grades 1-3 the teacher would remain in place, playing a traditional role at times and, at other times, supervising a number of groups, each ably staffed by a programed teacher.

Using Modular Instruction

The use of learning modules at grades 4-6 seems the answer to a teacher's prayer — a teacher who has to provide meaningful learning experiences for all the pupils in a class who have various interests, abilities, and levels of achievement. When tied to a system of individual record-keeping, modular instruction is a means for teachers to keep a tab on each pupil's progress. It seems, too, that the use of modules can meet the needs of those pupils who for one reason or another have to be absent from school or even to drop out. Their academic reentry points can be identified; they can be easily put on stream again.

Because, to use modules, the pupil must possess highly developed reading skills, other approaches to individualized instruction should

also be tried. These should appeal to the slower learners. Two that seem appropriate are: learning activity centres and projects.

The idea is that the teacher be mostly a supervisor of instruction — monitoring the work of the groups and providing help as needed. To ensure that he or she does not appear to be available only for remediation, the teacher should sometimes intervene and play a traditional role, relating to the whole class or to a part of a class.

Activities and Learnings

Project Primer is now in its second year. During the first year, a number of preparatory activities were undertaken to facilitate smooth implementation. Care was taken to establish an organizational structure that would ensure that all the divisions of the Ministry of Education would be constantly informed about the activities of the project. A steering committee, whose members represent a number of interest groups, was named to advise the director; a review committee was also appointed to monitor all the operations of the project and to recommend to the Minister of Education the form that each phase of the project should take.

Ten all-age schools (pupils aged 6–15 years) in rural Jamaica were selected for participation in the project — five of them to be experimental schools, the other five to be control schools. As far as possible, the two sets were matched for geographical location, school population (approximately 1500 each), staffing, pupil performance, and evidence of harmonious school-community relations.

Six experienced primary schoolteachers were released from their schools to work as curriculum writers for the project, and, after brief training, they started writing the teachers' guides and pupil materials for grades 1, 2, and 4. Before beginning the writing, however, they spent time analyzing the existing curriculum and modifying the content to meet the peculiar needs of the project schools. They also refined and reordered some of the instructional objectives, especially to facilitate integration across subject areas in the lower grades.

The teachers in the experimental schools were given a total 5 weeks in-service training to prepare them for using the new materials and the new approaches to classroom organization and management. The training programs were designed to meet the needs of these teachers: needs expressed by the teachers themselves and those identified through questionnaires, interviews, and in-class observation.

During the first year, too, a community awareness program was launched. Through the local parent-teacher association (PTA) each community was told of the objectives of the project and of the methods to be used to accomplish these objectives. The communities have so far shown much interest in the project and have demonstrated their interest by contributing substantially to the upgrading of the physical facilities and the maintenance of the school food program.

Project implementation began in September 1980 at the beginning of the current school year. It would be inappropriate at this time to talk about results. The experiences so far have, however, helped to bring into sharp focus some of the realities related to the development and implementation of a project of this kind.

A nontraditional management system stands a chance of successful implementation if, and only if, all the component parts are ready and can be put in place simultaneously. One year's lead time was not enough for the preparations needed. Only a small portion of the materials needed was ready when September 1980 came. Teachers and pupils who had been prepared for their use were disappointed and frustrated at the paucity of the materials, and some teachers were reluctant to return to their traditional roles that required them to prepare all lesson plans and supporting materials. Nor could the related evaluation and record-keeping procedures be put in place. To develop quality materials and to prepare for putting all the components of a new system in place take considerably more time than was expected.

It is to the credit of the writers that by the beginning of the second term they had produced so many more materials that they could even keep one step ahead of the pupils. They demonstrated that there are competent teachers in the classroom, who, through experience and application, have gained an in-depth knowledge of the characteristics of Jamaican children as they pass through the various developmental stages. They were able to bring to the task of writing materials, for these children and for their teachers, a knowledge of the existing interests and achievement levels. The experience confirms that classroom teachers can be trained in a relatively short time to be competent writers of curriculum materials. A survey could be undertaken to identify such teachers and a strategy developed for giving them specific training in writing, so that the writing of curriculum materials may become, as it ought to be, an ongoing activity.

It seems, too, that most practicing teachers need to be retrained to accept a role that keeps them from the centre of the stage. An understanding of, and a verbal commitment to, a child-centred program does not guarantee the disappearance of authoritarianism.

Admittedly, there was a gap in time between learning the new methods and the practicing of them. But this could hardly explain the failing on the part of most of the teachers to put the children to work independently. It is possible that the in-service training was too short or did not use the correct methods. A revised program is now being implemented.

Fortunately, one teacher training college is closely associated with the project and is now assessing the implications of these learnings for the preservice training of teachers. The college plans to experiment with a revised curriculum to be delivered via new instructional methods.

The role of the principal as manager and chief supervisor of his or her school has also been examined. Although no systematic study has been done, it has been observed that, where principals know and understand the programs in their schools and where they are prepared to monitor the various activities on a continuous basis and to take full responsibility for the operation of the school, improved teacher and pupil performance do result. It is planned to make a study of this phenomenon during the next school year.

The response of the communities to the appeal made for support of the project has been heartening. It is clear that a community whose members understand the objectives of its school's program can be a

great source of help and support for all those who work in that institution. During the next year, community surveys will continue to identify the skills that reside in the community and measures will be taken to utilize these skills in the formal education system.

The major question yet to be answered is whether when the system has been put in place and working, the results will be improved pupil performance and reduced waste. Research activities during the next school year must seek to isolate the variables so that the factor or factors preventing or facilitating the achievement of the project objectives can be identified. Will the supply of sufficient instructional materials result in better pupil performance? Can their performance be improved if the teachers are trained, or can the materials, on their own, accomplish the task? What is the relationship between "oppressive" evaluation systems and the development of a negative self-concept and the evidence of achievement? Though answers to these questions should not be expected at the end of a single school year, it is important that strategies be devised and activities be pursued throughout the implementation period that will give clues over time and even answers at the end of the 6 years when the first set of pupils will have gone through the primary system.

Of course, the forces at work outside the classroom that influence so much the successes or failures of the in-classroom activities cannot be overlooked. Chief among these is the incidence of absenteeism from school. It is reported that, of the enrolled Jamaican school population, only 65% attends with a fair degree of regularity. The best planned system is doomed, and there can be considerable waste, if the pupils for whom it is meant are not available to benefit from it. The government is committed to the concept of compulsory education at the primary level. If this program of instruction can help to encourage regular attendance among a larger percentage of pupils than now exists, much will have been accomplished. Attendance records will be closely monitored for changes in attendance patterns.

Further research must no doubt examine what are the causes of poor school attendance. For pupils who are forced to be absent for legitimate reasons, the individualized programs at the upper primary level should be particularly useful. Working at home, they could continue with their learning activities. On their return to school, they would be able to continue.

And what are the effects of the provision of physical facilities? Research into the contribution of these to the achievement of educational objectives must, in time, be undertaken.

Maybe the greatest learning of all is that the more an experimental project seeks to find out, the more it unearths that needs to be found out. Indeed, it can be said of Primer: it has taught us how little we know of our system and how much we need to know. The challenges are great. They are willingly accepted.

Liberia's Improved Efficiency of Learning Project

The educational needs of Liberia are similar to those of many other developing countries; national goals are to improve the quality of education, access to it, and the efficiency of the delivery system. A *Liberia Education and Training Review Memorandum* (World Bank 1979) elaborated this approach, and an *Education Sector Policy Paper* (World Bank 1980) has endorsed it for developing countries in general.

The population of Liberia is about 1.8 million. About 70% of the people live in rural areas. The population is increasing at an annual rate of about 3.3% overall and 8% in urban areas. English is the official language and is used for instruction in all schools. About 16 languages are spoken in the country.

Access to education in rural areas is especially restricted. Although about 50% of school-age children are now enrolled in government and private primary schools, the availability and quality of schooling are skewed in favour of the urban centres, especially the capital, Monrovia. Liberia has adopted a policy of universal primary education, but extension of the present conventional model to achieve this goal is not economically feasible in the immediate future. The restrictive cost factors that Hultin and Jallade (1975) emphasize for developing countries in general apply to Liberia.

The efficiency of the school system is low. Of every 1000 students who enter at the preprimary level, only 175 complete primary school. More than half leave the formal system before reaching literacy. One major cause of the low quality of education is the lack of textbooks and related materials in most primary schools. Although only estimates are available, it is likely that fewer than 3% or 4% of students can afford the prescribed textbooks.

Quality of primary education is also affected by the severe shortage of trained teachers. In 1979, there were 811 government primary schools, staffed by 3480 teachers. Only 29% of these teachers were fully trained: 48% were underqualified (they were high-school graduates with no teacher training), and 23% were unqualified (they did not graduate from high school and had no teacher training). The two teacher-training institutes in Liberia, Kakata Rural Teacher Training Institute and Zorzor Rural Teacher Training Institute, do not prepare enough qualified teachers even to keep up with attrition in the teaching force and the growing school population.

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The general strategy for education is stated in *The National Education Plan 1978-1990* (Ministry of Education 1977). Over the next few years, the Ministry of Education will focus on: implementing the new curriculum, increasing rural access to schools, improving skills within the primary teaching force through preservice training and a new inservice training program, upgrading the facilities of all existing primary schools, supporting a new program to produce and distribute educational materials, and exploring an innovative program for increasing efficiency of primary school instruction.

PLANNING

The immediate technological antecedent of the Improved Efficiency of Learning (IEL) project is Project Impact in the Philippines. Project Pamong in Indonesia, Project Inspire in Malaysia, Project Rit in Thailand, Project Primer in Jamaica, Project SAGE in Canada, and Project Distar in the United States all reflect variations of the same general theme: separation of the design and planning function from the implementing function of teaching.

Initial planning began late in 1976, when the concepts of low-cost innovations in programed instruction developed and tested in Impact and Pamong were discussed with Liberian educators by members of the education staff of the U.S. Agency for International Development (AID) mission to Liberia. These discussions led to an AID/Liberia-sponsored visit to Southeast Asia by a delegation of senior Liberian educators. The purpose of the visit to Impact was to provide information not for a replication but for an assessment of whether the elements of Impact could feasibly be adapted to Liberian efforts to improve the performance of underqualified and unqualified teachers. That visit led to the design of the IEL project, which is an excellent example of technology exchange between two developing countries.

The visit was followed by about a year of intense planning, involving Ministry of Education staff, other Liberian educators, and AID/Liberia professional staff. This process delayed final approval of the IEL project for about a year, but it was important for two reasons. First, it ensured that the project was designed to suit the unique educational requirements of Liberia, rather than being a simple replication of an approach that had worked elsewhere. Second, because Liberians were involved in all aspects of the design, it ensured endorsement of the project by the educational establishment.

Although a few project planners, inside and outside Liberia, regarded this delay as unnecessary, the nontraditional aspects of the project made it wise to wait until support was widespread. Endorsement by a number of Liberian educators has more than justified the delay and has helped considerably with the process of implementation. I emphasize this point because many projects are designed and promoted by consultants and development agency personnel without sufficient local involvement. This approach may facilitate planning and funding, but it often results in projects that do not conform to the constraints of local resources and tradition and are seen, correctly, as externally imposed.

They may be accepted by a developing country eager for external funds but often fail to operate after foreign advisers leave.

MODEL

Most educational models assign teachers the dual role of planning instructional strategies as well as executing them. It is sometimes useful, however, to separate these two responsibilities. The planning and the development of instructional strategies require a high level of expertise. Their implementation, however, can be done by persons not formally qualified as teachers. Ellson (1973:42) makes this clear:

> One who teaches according to a program planned by others needs far less training than the professional teacher who is expected to plan as well as to teach.
>
> The separation of the planning and execution functions in programmed teaching may be compared with the separation of the functions of composers and performers which occurred in the field of music several hundred years ago in Europe and a thousand years ago in Asia. When all performers were also composers, good music was a rare commodity, and expensive. When composing was reserved for those who have the necessary very special qualifications and performers were not required to compose, it became possible for many more people to perform. Simultaneously, the quality of music improved and it became more generally available. In music, good composers are rare, potential performers are many. The same is true in education.

Planning and execution (composer and performer) were clearly separated in Impact: a highly qualified research staff developed programs, and a group of older elementary students executed the programs in teaching young students. A similar separation is planned in Liberia, although performers will be underqualified and unqualified teachers.

The following description of the IEL project model is tentative, as this report is being prepared midway in the project. As instructional materials are tested and the model itself is tried in a number of schools, adaptations will be made in the light of formative and summative evaluations.

INSTRUCTIONAL MATERIALS

Two basic modes of teaching, programed teaching (PT) and programed learning (PL), were selected. All prescribed or controlled instructional processes are referred to as "programed instruction." When the teacher and the teaching process are guided by procedures that specify precisely what and how to teach, it is termed PT. When the learner and the learning process are so guided, it is termed PL, the form of programed instruction that typically produces learning without direct involvement of a teacher.

Instructional materials are organized in modules for both PT and PL. PT modules are prepared for most of grades 1-3 and PL modules for grades 4-6. Grade 3 is transitional, with PT used in the first half

year and PL in the second. About 40 PT modules are being prepared for each of the first two grades and 20 for the first half of grade 3. Sixty PL modules are being prepared for the second half of grade 3, and 145 modules for each of grades 4–6. Subjects covered are language, reading, mathematics, science, and social studies for all six grades, plus arts and crafts for grades 4–6.

Content for all PT and PL modules is based on the revised national curriculum (RNC) of the Ministry of Education. The RNC sets out the philosophy of education; its broad goals; and, for each grade and subject, general and specific objectives, scope and sequences, and content and activities. Before development of the modules began, the RNC was fully analyzed. It was found to need refinement and clarification. There were wide variations in the details among subjects and grades and much repetition. The project staff developed a working curriculum, based on the RNC, that was then reviewed by a subcommittee of the project's steering committee.

MANAGEMENT

Instructional supervisors will each supervise the work of 25–30 teachers — the average number of teachers in four to five rural schools, each with six grades and one teacher to a grade. Supervisors will have no teaching duties and will probably be recruited from the fully trained teachers now in the Liberian system. Most teachers will be responsible for a single grade, but in small schools one teacher may be responsible for several grades, both PT and PL.

During each 45-minute lesson the first third of the time is devoted to PT, the second to practice, and the third to review. Active participation by the teacher is not required for the practice and review parts of lessons; thus, one teacher can manage three groups of 15 students, simultaneously with a resulting student:teacher ratio of 45:1.

For the PT part of the lesson, the teacher follows a prescribed procedure, using a PT booklet displayed so all 15 students can see it and asking questions that require group responses. If any student gives an incorrect response, the teacher follows a prescribed remedial sequence, such as modeling the correct answer, before asking again for a group response. The teacher uses signals, such as pointing to an item in the booklet, so that all students will respond together. Teachers are trained to recognize hesitation by any student so he or she can be given immediate help. As a further precaution, the programs have sufficient redundancy so that all students will learn all the material without the need for the teacher to diagnose every individual difficulty. (Some forms of PT, such as reading and writing, do not precisely follow these procedures.) After a 5-minute rest, the group moves to the practice session.

The purpose of the practice session is to allow students to master the content and skills of the PT lesson just completed. This usually is done without the direct guidance of the teacher, who by now will be managing a PT lesson for a different group. For practice, the group of about 15 students usually divides into three subgroups. They are given practice materials (usually flash cards) that repeat the content of the

PT lesson. They take turns asking each other questions in a programed sequence specified by the practice materials. During the practice session, the teacher is available to assist with any problems.

The review session follows the practice part of the lesson. Its purpose is to strengthen the mastery gained in previous lessons. The content of the review session, therefore, is that of the previous few lessons. Usually the subgroups of students are the same for practice and review. Various learning games and other activities are included, often with competition among subgroups. As with the practice session, review takes place without the direct intervention of the teacher, who is nonetheless available for assistance.

In the last 3½ years of school, students learn with PL in groups of five to eight. The PL modules are used, with the teacher acting only as a monitor and resource person. The groups use PL booklets, which they study as a group with leadership rotated among all members. A leader's booklet provides a detailed learning procedure and contains answers to the practice questions that are an integral part of each program. One teacher can supervise the activities of as many as 12 groups, making possible a student:teacher ratio of 96:1.

For all grades, a daily 45-minute period is scheduled for remedial activities. This allows the teacher, older students, and more capable peers to assist any student having difficulties. This time is especially valuable for students having problems with particular material or who have been absent. Tests, given after about 14 hours of PT learning and 5 hours of PL, identify students who need further assistance.

Teacher Training

Teacher training will be of two types. First, instructional supervisors and the PT and PL teachers will be trained in 2-week workshops. The second type of training will be on the job through instructions written into the materials themselves and through continued inservice training as needed.

Project Organization

The project is located in quarters provided by the Liberian government at Gbarnga, the capital of Bong County, about 200 km northeast of Monrovia. It is directed by Janice Vani, former head of the department of education, Cuttington College. She reports to the deputy minister for instruction in the Ministry of Education, and the deputy minister operates through a steering committee that develops and adapts policy for the project and continuously reviews project activities. There has been a reasonable working relationship between the project and the committee.

The project is organized into six units: instructional design, implementation and training, evaluation, production, administration, and teacher education. Each unit is headed by a Liberian, and one of the advisory field staff is assigned to work with each. From the inception, Liberians were placed in line positions to promote institutionalization.

Six full-time advisory field staff are provided to the project through the Institute for International Research (IIR).

Because of the large numbers of educational materials needed, special provisions were made for inhouse production. Besides general office equipment and furnishings, AID has provided two word processors, a printer, and two photocopiers. The word processors have been valuable for repeated revisions during production, and the photocopiers facilitated numerous layout changes without the costs and long delays of mimeograph or offset masters. Five vehicles have been provided for the extensive travel necessary between the project site, schools, and Monrovia.

Staff Development

Training for the Liberian staff is given high priority because of the project's emphasis on institutionalization. As specified in the project plans, training is of three types: long-term degree and nondegree, short-term, and on the job.

Long-term training consists of master's or equivalent training for the Liberian administrative heads of the evaluation, implementation, and instructional design units. This will take place at universities in the United States. The long-term training is now behind schedule, and there is some concern about the possible detriment to institutionalization.

About 46 person-months of short-term training will be provided. This will consist of training in programed instruction for writers plus courses and project-site visits in the U.S. and other countries. Much of the short-term training has already taken place. A 1-month writers' workshop at Gbarnga in March 1979 focused on instructional techniques, covering behaviourally stated objectives, measuring achievement of objectives, principles of programed instruction, programed teaching, and group- and self-instructional programed learning. The 34 participants in this workshop were selected by the Ministry of Education in consultation with the project director. The ability to learn programing techniques and apply them with clear and simple language were the principal criteria for selection of 13 of the participants to attend a subsequent 3-month workshop in the United States.

A 3-month course on programed instruction at Indiana University was conducted May through July 1979 through a subcontract with Delta Associates. This course, designed for IEL project writers, emphasized application rather than theory. The programed instruction techniques taught were derived from Impact, other similar programs, and results of the Bloomington conference on instructional technology.

The on-the-job training is a mutual endeavour between the Liberian educators and their IIR colleagues. Because this is taking place on site, it tends to be more responsive to local requirements than out-of-country training. The full-time advisory field staff and consultants are a rich resource of technical expertise for this training. Daily interactions among Liberian staff and IIR advisers have proved effective for developing appropriate skills in both staffs. The fact that most of the advisory staff have had extensive experience in developing countries has made this interaction most effective. For example, two of them worked for

Table 1. Schedule for production and tryouts by grade.

School year (March-December)	Laboratory school	System schools	Experimental schools	Control schools
1980	1-3	-	-	-
1981	1-4	1-3	-	1-3
1982	1-5	1-4	-	1-4
1983	-	-	1-6	1-6

years full time on Project Impact; a third joined the advisory staff following a career with the West African Examinations Council and 2 years as a World Bank/UNESCO teacher-education adviser with the Liberian Ministry of Education. Another, born and educated in India, is thoroughly familiar with problems of education in developing countries, whereas a fifth member brought to the project her experience with PL in Brazil and with Project Distar in the United States, which uses instructional methods similar to those of Impact and Pamong.

Materials Preparation and Production

The schedule for production and tryout has four phases (Table 1). These involve use of the materials in the laboratory school, the system schools, the experimental schools, and the control schools. The laboratory school is located at Gbarnga and is used for initial tryouts of the materials. It provides early feedback to the writers.

The five system schools are representative of schools in the rural areas of Liberia and were selected because they are within a few hours of Gbarnga. There are 10 experimental and 12 control schools in which the third and fourth phases, based on revisions resulting from the earlier tryouts, will take place. A contract requirement to conclude evaluation in 1983 precludes earlier tryout of grade 6 materials.

The approval process is controlled by the steering committee, which has been kept informed of project development, including changes in plans and schedules, through periodic meetings. Interaction with the committee, which has been useful for all aspects of project development, ensures all project activities are highly visible within the Ministry of Education. No formal process for review of each module has been established; it probably would not be workable because materials for six complete grades must be developed within 4 years. The absence of formal review has so far presented no problems, nor are any anticipated in view of the close working relationships among the project staff, steering committee, and Ministry of Education.

The design process has five components, none of them discrete. These are task analysis, preparation of objectives by module, development of criteria by module, the module outline, and the module draft. These design tasks are all completed before any formative revisions are made, but the presence of experienced teachers among the project staff ensures even the early drafts are sensitive to local conditions.

Work proceeds from writers to editors and to the production coordinator, who deals with the typists, illustrators, printers, and staff

of the implementation unit to produce the first version of the modules ready for tryout.

Revisions are based on three types of feedback, two from formative evaluation and one to come from the summative evaluation. The formative-based changes come from tryouts in the laboratory school, which is 1.6 km from the project site. Its students were recruited from nearby schools; the school now has grades 1–4, with about 15 students in each grade; grade 5 will be added in 1982. Data for the revisions are obtained by observation, interviews with teachers and students, and results of the end-of-module tests. Formative evaluation will continue with the five system schools according to the schedule (Table 1) and will form the basis for any revisions before the summative evaluation, which will be in 1983.

TEACHER EDUCATION

Assisting the Ministry of Education with teacher education is an important part of the IEL project. One person has been given primary responsibility for this component. He is a full-time member of IIR's advisory field staff assigned to the Ministry of Education at Monrovia. He closely coordinates all ministry plans for teacher education, particularly with the anticipated effects of the IEL project.

The primary responsibility of this adviser is to assist in developing a national plan to improve education for teachers in elementary and junior secondary school. This activity is closely coordinated with IEL activities in four areas:

- The analysis of the current primary curriculum required in the early stages of the project.
- Determination of teacher characteristics, as they were at the beginning of the project and as they are being changed by current developments in preservice and inservice teacher training.
- Similar determinations of teaching methods and educational systems as they evolve during the project.
- Encouragement of interaction between the design of the various components of the project and corresponding components of the existing education system.

This adviser will ensure that all aspects of the project's technology will be compatible with the national educational system should the evaluation prove satisfactory and the decision then be made to expand the IEL model. Considerable advance planning will be necessary if Liberia adopts the IEL model nationwide, and this adviser thus has a critical role in determining the success or failure of any widespread implementation.

Project staff at Gbarnga have developed a 2-week PT course to train teachers; a similar PL course is almost completed. Thus Liberians with no formal teacher training and only a high-school education will be trained to manage learning with the PT or PL modules or both under an instructional supervisor. Their skills are expected to improve continually on the job. One source of the improvement will be the information directed toward teachers within the materials themselves; a

second will be feedback from supervisors; and a third will be actual practice.

Teacher education under the fourth World Bank education project in Liberia, currently in the planning stages and expected to begin in April 1982, is fully coordinated with the IEL project. Although the content of the World Bank project is not yet finally decided, it will probably provide about 3000 training months through on-site workshops to enhance the teaching skills of all government primary schoolteachers — about 3000 of them, including expected newcomers to the teaching force in the 4-year life of the project. Continuation of the training will be achieved by inexpensive, self-contained, mobile, teaching-skills workshops.

If the IEL project is not effective for Liberia, this component of the World Bank project will continue to provide inservice training. If the IEL project is effective and is widely implemented, this component will form the infrastructure for the 2-week PL and PT workshops. Cooperative planning will thus result in the more effective use of assistance from both AID and the World Bank.

EVALUATION

The evaluation will determine whether appropriately supervised underqualified and unqualified teachers with some additional training can manage PT and PL classroom activities with no reduction in student achievement. The results that these teachers obtain will be compared with those of teachers using traditional methods.

The preparation of effective instructional materials will benefit most from the formative evaluation, and the model itself will be tested by the summative evaluation. The formative evaluation, discussed earlier, will provide feedback during all stages of project development.

The summative evaluation will assess administrative aspects of the IEL model as well as student achievement. It will be based on an experiment involving 30 schools. There will be 10 IEL schools, 10 *status quo* control schools (SQ), and 10 optimal conventional control schools (OC). The IEL schools will be operated to match as closely as possible the conditions that would exist if the IEL model were adopted throughout Liberia. The SQ schools will represent present primary schools, with underqualified and unqualified teachers predominating, insufficient textbooks and other materials, and with much student time being spent copying material written by the teachers on chalkboards. The OC schools will have full sets of prescribed textbooks, and their teachers will get special inservice training in the use of the textbooks with the present curriculum.

The 30 schools for the summative evaluation were selected from a pool of 49, with the IEL, SQ, and OC groups matched from reading and mathematics tests in grades 5 and 6, school enrollment, and attendance. With the above matching restrictions, 10 schools were randomly assigned to each of the IEL, SQ, and OC groups.

Achievement tests will allow the IEL model to be compared with the present model (IEL *vs* SQ), the present model to be compared with its fully implemented version (SQ *vs* OC), and the IEL model to be

compared with a fully implemented version of the present model (IEL *vs* OC).

From the 10 IEL schools, 5 were selected as system schools. They were selected because of the practical requirement that schools be within reasonable commuting distance of the project site, with the restriction that differences in the range of school size and achievement levels were well represented. In the 1981 school year, the IEL materials and management system are being introduced in grades 1-3 of the system schools. These materials and methods previously were tried in the laboratory school in 1980 and revised on the basis of the results. Grade 4 will be added to the system schools in 1982. In 1981, 10 comparison schools were selected from the OC and SQ groups. The OC teachers were given inservice training by the Kakata Rural Teacher Training Institute, and textbooks were provided to all students.

In 1983, the summative evaluation will take place in all 30 experimental and control schools. By this time, grades 1-5 will have been tried in the laboratory school, and grades 1-4 in the system schools (Table 1). Learning materials and procedures for all grades will be prepared in time for the 1983 school year. Grade 6 will not have been tried, and grade 5 will have been tried only in the laboratory school.

This is not ideal but is necessary because of a shortage of time and funds. Nevertheless, the project staff believes that feedback from the laboratory and system schools for the earlier grades can be used in preparations of the two higher grades without serious consequences.

All students were given pretests developed by the project staff and administered in grades 1-3 for all 15 schools now involved in the project (i.e., 5 schools each in the IEL, SQ, and OC groups). In March 1982, pretests will be given to students in grades 1-4.

Approval of this design for the summative evaluation, as well as details of the achievement criteria and analysis, will be under the technical control of an independent consultant to the project, who will report on the evaluation directly to the Ministry of Education and AID/Liberia. The measuring instruments will be developed by the Liberian national office of the West African Examinations Council (WAEC), an international organization for educational assessment and related research serving the member countries of Nigeria, Ghana, Sierra Leone, Gambia, and Liberia. The IEL project staff will work closely with the consultant and WAEC to agree on criteria for the final design, detailed plans for the experiment, and the proposed data analyses. The project staff, however, will have no direct involvement in test development, administration, scoring, or analysis. This stipulation will ensure that the final assessment of the model is independent and objective, free from even the appearance of bias. This is regarded as essential by the project staff, the Ministry of Education, and AID/Liberia.

Results of the summative evaluation will have significant implications for the future of primary education in Liberia. If the summative evaluation is positive, the number of primary students may double relatively soon with no increase in current expenditures. This is the outcome projected from extensive evaluation of the related technology of Impact.

Table 2. Projected costs for IEL expansion (U.S.$000).

Category	9-year cost	Average annual cost
Materials	4835	537
Distribution	242	27
Teaching training	1962	218
Research, development, and evaluation	1389	154

Tentative plans are — if results are positive — to extend the model to approximately 90 schools after any changes in the instructional materials or management system suggested by the summative evaluation. The general intent, although the policy decision has yet to be made, is to expand the system nationwide if it is proved effective. This would require considerable changes in the teacher-education program as well as promotion to ensure public support and acceptance.

AID/Liberia is making tentative plans to assist the Ministry of Education with an implementation phase to begin in 1985, contingent on evidence that the IEL model is an acceptable and cost-effective alternative to current practice.

COSTS

Development costs are of two types, those underwritten by the Liberian government and those underwritten by AID. The current estimate of the total development cost is approximately U.S.$6.9 million for the 5 years of the project. This consists of about U.S.$1.9 million provided by the government in cash or kind and about U.S.$5 million by AID. The government's contribution is in the form of staff salaries, office space, some operational fees, and some local and international travel. AID pays for approximately 25 work-years of full-time advisory services (six positions), 24 work-months of expert consultant services, training for Liberian staff, office and household furniture, materials, office equipment, vehicles, operating expenses, and IIR home-office support services.

Operational or recurrent costs are difficult to estimate as yet. Dougharty (1982) has made rough estimates (Table 2) as part of an assignment as a consultant to project overall educational costs for Liberia for 10 years. His estimates are based on expansion of the IEL model to all present government primary schools over 3 years, one-third of the schools yearly. Some of his assumptions have not been examined carefully by ministry and project staff.

Dougharty examines several alternative strategies. One recommendation is to use methods — such as those of the IEL project or available through educational radio — that need fewer fully trained teachers and materials.

If the summative evaluation of the IEL project is positive and costs of implementation are as low as estimated by Dougharty and others, this low-cost alternative to traditional education may be a significant contribution to quality basic education for many Liberian children.

Origins of Projet SAGE and its Evaluation Scheme

In this exposé, I would like first to provide answers to the fundamental questions about the origin of Projet SAGE (Flores 1981). Whose innovation is it? Why was it started? Second, I shall describe the general plan that was followed to evaluate the use of the system in the experimental schools.

From 1956 to 1959, I worked as a secondary schoolteacher in northern Ontario. During those years, I became aware that the students who entered my class with good grades would continue in that vein and those who had performed poorly until then would continue to live a risky life within the school system. My performance as a teacher had little impact on their future. There was not much that I could do to change that state of affairs during those years. But I believed that there had to be a way to change things in the classroom.

A decade later, as I was attending the annual meeting of the American Psychological Association, I was impressed by a paper presented by John Flanagan on individualized instruction. He explained the rationale of Project PLAN (program for learning in accordance with needs) that he had initiated at the American Institutes for Research.

Project PLAN (Flanagan 1970) was an individualized system of instruction for the elementary and the secondary schools. Its aim was to help students to participate more fully in the planning and management of their classroom life. Flanagan felt that the ability of the students to manage their classroom life was a prerequisite to a successful career in later life. His research had convinced him that the school system did not pay enough attention to this basic need. From his point of view, too many secondary school students were unable to plan adequately for their future.

I became convinced that Project PLAN offered a model of classroom organization that could be helpful in Quebec, but I had to wait a few years before acting on the idea.

In the meantime, I became familiar with the educational policy of the Ministry of Education concerning *le progrès continu*, a policy designed to allow students to make progress in a continuous manner, at all times and in every situation. In other words, I discovered that the Ministry of Education of Quebec was attempting, as an important objective of its action, to suppress barriers to progress in learning.

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This policy was already well formulated in the province at the beginning of the 1970s. In 1971, it was inserted in the official regulations of the Ministry of Education that the organization of learning activities must take into account individual characteristics of students and allow for the possibility of continuous progress in the pursuit of teaching objectives at the kindergarten and elementary levels, as defined in the official programs.

The regulation made it mandatory for schoolteachers to individualize their teaching in an intensive way, but the Ministry of Education made no special plans to provide the means necessary to enact the regulation. The school personnel were left to their own initiative and resources.

In 1972, I felt that a group of researchers could help fill the gap between the end and the means of individualized instruction in Quebec. So, I decided to write a proposal along that line, and I presented it to the Director of l'Institut national de la recherche scientifique (INRS), Charles Beaulieu.

This proposal contained no extensive survey of the research literature. It probably would not have been approved by any serious granting agency in Canada. However, the founder of our national institute approved wholeheartedly of the idea, probably because it was the kind of research and development program that he was looking for to establish a research centre in education within the institute that he was directing. As a matter of fact, Projet SAGE was to become the main research program of the centre during the 5 following years (1973-77). The centre was under the direction of Gilles Dussault during those years, who was fully committed to the success of that research program.

The objectives of the project were:

- To promote the evolution of the school system by providing the tools and the management system for individualized instruction;
- To evaluate the effects of the system on students, teachers, and the school environment; and
- To use learning activities as the principal means to develop autonomous and responsible behaviour among all actors in the classroom.

After its approval by the board of INRS in 1972, the project was presented to the deputy minister of the Ministry of Education of Quebec.

A committee was formed by the Ministry of Education in December 1972 to study the project. Three months later, the eight-member committee unanimously recommended the realization of the project, because it was related to the priorities of the Ministry of Education and because it was an appropriate answer to a need felt by the schools.[1]

The recommendation of the committee was well received at the Ministry of Education. In the fall of the same year (1973), the deputy

[1]Avis d'opportunité : « A la suite de ses travaux, le comité est unanimement favorable à la réalisation du projet SAGE. Ses objectifs s'inscrivent dans les priorités du Ministère au niveau élémentaire et répondent aux attentes du milieu. Le Comité recommande donc aux autorités concernées du Ministère de l'Education de prendre les mesures qui s'imposent, dans les meilleurs délais, pour la mise en marche du projet, après que des modalités auront été spécifiées. »

minister established a steering committee for Projet SAGE. This committee held regular meetings from 1973 to 1977. It presided over the orientation of the project during those critical years. Without its contributions and support, the small group of researchers at INRS-Education would not have succeeded in gathering all the resources that were necessary for the success of the undertaking.

To secure the approval and the support of the Ministry of Education was necessary for the success of the project. But the project needed also the cooperation of the school boards. School boards, in Quebec, are democratic organizations that enjoy autonomy from the Ministry of Education. They assume responsibility over teachers and students in public schools.

Fortunately, a school board near Quebec City was willing to sign a 3-year agreement with INRS for the development, experimentation, and evaluation of Projet SAGE. This agreement made it possible for the staff of the first experimental school to work in cooperation with the SAGE research team. Together, we defined the learning objectives. We tested the teaching and learning units with their students. Furthermore, we conducted the evaluation of the system.

Based on this historical account of the first 2 years of Projet SAGE (1972-73), I think it is possible to provide an adequate answer to the questions: Whose innovation was it? Why was it started?

At the end of 1973, three organized bodies (a research institute, the Ministry of Education, and a school board) had committed themselves firmly to the support of the project. However, the project originated from a research body and not from the Ministry of Education or the school board.

Projet SAGE was originally the idea of a group of researchers who agreed that there was a gap between the educational policy of the Ministry of Education and the means available to the school people to realize that policy. For better or for worse, it is still identified with INRS-Education. Our group of researchers managed to obtain the cooperation of the school people and of the Ministry of Education to fill that gap until 1977.

However, in 1978, the Ministry of Education became hesitant toward the undertaking and abandoned the research group to their own resources. Simultaneously, the school people made pressing demands for dissemination of the system that our limited capacity of production could not satisfy entirely. Even today, we have not been able to come to an agreement with any of the possible publishers.

The publishers are frightened by the huge investment that they would have to make. They are not convinced that individualization will influence the market in any important manner in the coming years. However, there is one exception. Les Presses de l'Université du Québec is showing an interest in our product.

The present situation of our research group could be characterized in the following manner. Our clients tell us that we have developed a good product, but we do not have the means to deliver it to others. The main reason for this situation is the move of the Ministry of Education toward other priorities since 1978. The definition of new programs for all school subjects is drawing much of its resources at present.

In the meantime, our research group is confident that we will find a solution to the dissemination problems. The main reason for our optimism is the attitude of the school people who want the product we have developed. We are determined that they will have the last word in the venture. INRS has been created to make available to the people the advantages that are derived from research. We shall continue to pursue that goal.

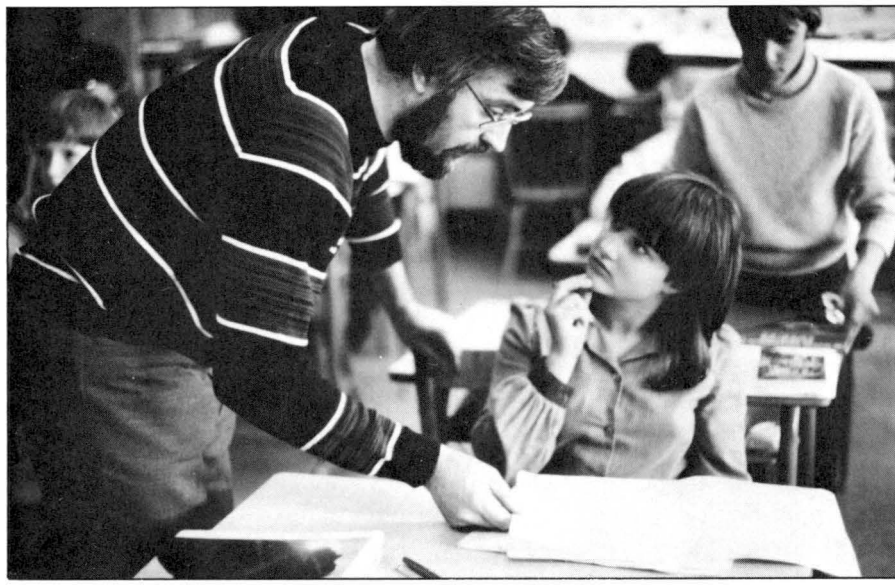
THE EVALUATION SCHEME

There have been many kinds of evaluation of Projet SAGE during the 9 years of its life. They include the evaluation of the drafts of the first teaching-learning units by a visiting scholar, Dr Horacio Rimoldi; independent evaluations by the first school boards that invested their resources in the experiment; evaluation by the mass media, etc. In this exposé, I shall describe only the evaluation study conducted by INRS-Education with the cooperation of the two experimental schools.

The study was conducted during a 5-year period (1974-79). It began when the teaching-learning units were used for the first time in the first experimental school on a regular basis (September 1974).

The evaluation plan was very simple. We followed the basic model of testing hypotheses with experimental and control groups. The main objective of the project was the development of a classroom management system that would allow the students to take more responsibility in their learning activities and to develop a more autonomous behaviour in the classroom. Through the eight hypotheses that we selected, we were trying to see whether that basic objective was reached, at least to some extent. The eight hypotheses were:

- Students in Projet SAGE develop certain fundamental reasoning capacities as well as do students in regular classrooms.
- Students in Projet SAGE learn what is taught in an individualized manner as well as do students taught in the regular manner in control classrooms.
- Students in Projet SAGE develop a higher self-esteem than do children in regular classrooms.
- Students in Projet SAGE show less anxiety than do students in regular classrooms.
- Students show more appreciation of school topics taught in an individualized manner than do students taught the same topics in a regular manner.
- Students in Projet SAGE have more opportunities to assume responsibility for their learning than do students in regular classrooms.
- Teachers in Projet SAGE take less time teaching their class as a whole and more time taking care of individuals or small groups than do teachers in regular classrooms.
- In taking care of individuals or small groups, the SAGE teacher is less concerned about content than about guiding and giving orientations to students, encouraging those whose motivation is low, verifying students' progress in learning, and solving com-



Does a SAGE teacher spend more time helping individuals than do colleagues using the conventional approach?

munication problems among students. Here again, the behaviour of teachers in SAGE classrooms was to be compared with the behaviour of teachers in regular classrooms.

The testing of the last three hypotheses required the observation of the behaviour of students and teachers. That investigation was conducted by Mariel Leclerc (p. 67).

The first two hypotheses had to do with intellectual functioning and learning achievement. During those years, teaching was individualized in a systematic manner mainly for French as a first language. We used the instruments developed by the Ministry of Education to measure intellectual functioning and achievement in French in the experimental and control groups. In general, we found that the hypotheses were confirmed. The experimental groups compared well with the control groups.

Testing those two hypotheses was very important for ethical reasons. We felt we had the moral obligation to show that the normal development of the students was not disturbed because of their participation in the experiment. We think that Projet SAGE actually permits better learning in French. However, it is not easy to demonstrate such a thing objectively during the experimental phase of a system like ours. It was a wise decision not to pretend that individualized education could do better during those years, because we would not have been able to demonstrate that fact.

The third hypothesis was more pretentious. We thought that our students would show a higher self-esteem. We used one scale of Coopersmith's self-esteem inventory (Coopersmith 1967). The hypothesis was verified only in 1 of 5 years of measurement. We now recognize that the hypothesis postulated an effect that was not in proportion to the experiment itself.

It would have been more relevant to measure the self-concept of ability toward school tasks or the academic self-concept in a manner similar to that of Brookover and Shailer (1964). It was too late when we realized our error.

The fourth hypothesis was concerned with anxiety. We assumed that anxiety, as measured by two instruments developed by Sarason et al. (1960), would be less high in the experimental group. Again, this hypothesis was unrealistic, even though it was confirmed a few times. It would have been sufficient to expect that the experiment would not generate in the students more anxiety than is generally found in the classroom. This fact was clearly demonstrated. We considered that to be an important finding in view of the fact that the system increases so much the responsibility of the students in the classroom. Furthermore, the system relies very much on the use of evaluative instruments in the daily life of the classroom. These instruments could have been perceived by the students as a continuing threat. On the contrary, it seems that the students were pleased to be given clear rules of conduct for learning and for evaluation. Clear rules of functioning in the classroom are something that children expect. They are not a cause for fear or anxiety, unless the rules become too rigid or discriminatory.

The fifth hypothesis postulated that children would show more liking for school subjects presented in an individualized way, than for the same subjects taught the regular way. This hypothesis was measured with an instrument constructed in our centre: children were presented with scales graduated from 1 to 9 and asked to rate the school subjects that were taught in their classroom. The results were clearly and consistently in favour of the experimental groups. Whereas the learning of the mother tongue had a very low status in the control groups, it was one of the most liked school subjects in the experimental groups. This finding is one of the most important of our study. It shows clearly, I think, that the individualization of instruction can easily increase the interest and the motivation of students of these age groups, if it is conducted in a systematic manner and with tools that can be put under the control of the students.

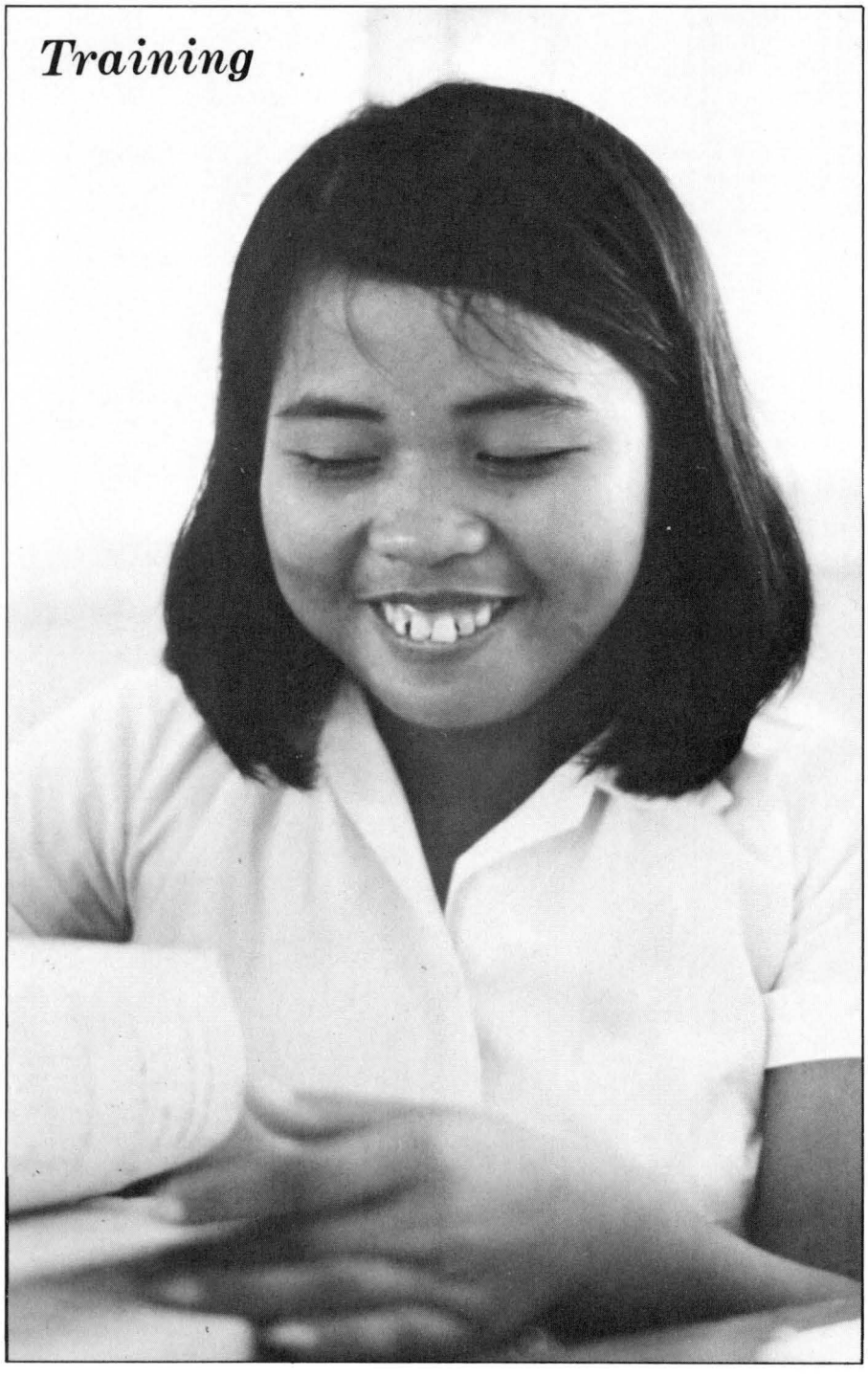
I have described in a very schematic manner the basic design of our evaluation study of Projet SAGE, to the exclusion of our studies based on observation. Many important additions and modifications were made to this plan, especially during the fourth year of the study.

The basic weakness of the plan, in my opinion, was the excessive importance given to the preconceptions of the researcher or principal evaluator. The identification of the criteria that should be used to evaluate an educational innovation should not be left to the principal evaluator (Cardinet 1979).

According to Cardinet, the role of the evaluation experts should become less authoritarian with regard to the opinions and feelings of all the persons involved in the innovation. Their main task should be to discover what the criteria are that the actors are using for their personal evaluation of the innovation. Second, they should try to discover whether the participants (students, teachers, parents, research team, etc.) are reaching some kind of consensus on their educational experience.

This lesson is the reason that, in the report of the last 2 years of the

evaluation, I have given more importance to the study of the opinions expressed by the school personnel, the students, and the parents. Hypothesis testing has been reduced to a secondary role, although I continue to consider it an important dimension of evaluation. One advantage of such a shift in emphasis is that the final product (the evaluation report) appears to be much more meaningful to the persons for whom it has been written.



Primary schoolchildren in Malaysia take a national examination in grade 5; the results of this test are a major criterion of success for Project Inspire.

Assessing the Impact and Effectiveness of Project Inspire's Educational Materials

The preliminary data collected during the early phases of Project Inspire in Malaysia indicate that pupils in rural schools suffer many disadvantages. They generally come from low socioeconomic backgrounds. Their parents either are illiterate or have very little formal education. They, therefore, tend to have little home-support for school-related activities. Facilities at home for the consolidation of their education are also generally minimal. They attend schools whose facilities and funds also tend to be relatively poor. Thus, instructional aids to enhance the learning of these children are normally minimal.

Furthermore, they are usually traditional in their views. Learning through observation may not be encouraged, and learning through interaction with adults tends to be discouraged. Thus, verbal and reasoning skills of such children tend to be truncated. As a result, they are usually unprepared to cope with the intellectual demands of learning such subjects as science, mathematics, or even a second language. Instruction in rural schools is not clearly conceptualized. As a result, teaching strategies tend to be mechanically applied and do not focus on a balanced development of children. Thus, for instance, group instruction is usually the teaching method. Individual differences among children with respect to their learning needs, interests, and cognitive styles cannot normally be catered to.

Classroom management is usually teacher-centred, the children having little opportunity to develop skills in learning independently and responsibly. Learning resources may not be appropriately managed, and children not given enough operations with concrete objects. Even opportunities for obtaining information through audiovisual aids may be few.

Such deprivations, if persistently experienced by children, result in serious consequences and may stunt the natural inclination healthy children have for learning. Also the system of large-group instruction usually produces errors in learning at every stage of study. Uncorrected, these become compounded during the years the children remain in school. Only rarely do pupils fully recover from the effects of compounded errors. Clearly, not all the solutions needed for these problems can be provided by education. Yet, it is the primary goal of Project Inspire (subsequently to be referred to as the project) to determine what

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can be realistically done, through instructional means to overcome some of the problems or to reduce some of the effects of deprivations and disadvantages. The particular problems that the project attempts to deal with are:

- The obsession, on the part of many teachers, to complete (cover) the official syllabus rather than to teach for the mastery of skills and concepts by learners.
- The wide variety in the quality of instruction that results from the different academic and professional backgrounds of teachers and their different concepts of what constitutes effective and efficient teaching.
- The undue dependence on textbooks for instruction and the consequent lack of imaginative and stimulating modes of instruction.
- The prevalence of large-group instruction, which generally lacks the mechanism for immediate and effective correction of errors in learning by individual pupils.
- The related limited use of the many available instructional strategies.
- The perennial neglect of pupils' differences.
- The genuine inability of teachers to provide individualized supervision of learning because of the administrative constraints.
- The traditional lack of meaningful opportunity for students to be active learners, work cooperatively, and deliberately interact with others.

Hence, the overall purpose of research and development for Project Inspire has been to determine, through a quasiexperimental approach, how to improve the learning efficiency of children in selected rural primary schools.

THE NATURE OF PROJECT INSPIRE

Project Inspire is seeking new instructional strategies for improving the quality of the teaching-learning processes in the rural primary schools in Malaysia. It intends to deliver, at the end of the project, a new set of instructional strategies that have proved effective, together with the materials that would be needed and with recommendations as to the best mode of implementation. This project attempts to study some new strategies for a better implementation of the school curriculum that has been prescribed by the Ministry of Education.

Also, the instructional modes chosen are intended to develop basic skills — cognitive as well as psychomotor — without neglecting the conceptual learning that should take place. In standards 1, 2, and 3 the instructional strategies aim at developing the reading, writing, and computational skills. At the same time, a positive attitude and independence in learning are to be cultivated. These objectives are consistent, we believe, with the recommendations in the Cabinet Committee's Report on the implementation of basic education in Malaysia.

This project more specifically attempts to investigate the use of an integrated system of programed instruction suited for rural environ-

ment. (Hence, the acronym Inspire.) There are two phases to the project. During the first phase the instructional package for standards 1, 2, and 3 will be developed and during the second phase those for standards 4, 5, and 6. In each phase, we envisage two stages. The first stage will be the development, revision, and improvement of materials on the basis of feedback from laboratory schools. The second stage will be concerned with the testing of the improved package in a number of rural schools.

PROJECT PLAN

This project's system of instruction calls for the appropriate use by teachers and pupils of selected strategies and techniques of teaching and learning. Programed and integrated into an overall pattern, it is called programed instruction. Because the skills to be developed and the capabilities acquired at the lower primary level differ from those in the upper primary, Project Inspire incorporates different blueprints for programed instruction at the two levels.

During the lower primary level, children are expected to develop literacy and numeracy skills — skills basic to independent learning. The bulk of teaching and management of instruction, at this level, will be carried out by teachers who will have been provided with a step-by-step program. The program is based on the premise that all or almost all rural children attending school can master the skills if appropriate conditions for learning are created in the classroom and school concerned. Creating the appropriate conditions of instruction is, thus, the focus of the project's program for the lower primary level. Teachers are to be provided with instructional booklets for every lesson they need to teach for 30 weeks in each year. The booklets are referred to as program teaching guides (PTGs).

The PTGs to be provided will cover every subject in the primary school curriculum except religious instruction and *Jawi* and will be influenced by the internal logic and structure of the subjects — Bahasa Malaysia, English language, mathematics, science, local studies, physical and health education, music, and arts and crafts.

For the upper primary level, in contrast, children are assumed to have acquired some basic literacy skills. Furthermore, they would have reached an age (about 10 years old) when they can reasonably be expected to depend increasingly less on the teacher. Thus, in addition to teacher-mediated instruction (TMI) guided by PTGs, the system incorporates module-mediated instruction (MMI) and peer-mediated instruction (PMI).

MMI and PMI promote increasing independence in the upper primary children. Modular instruction provides them with the opportunity to learn on their own by carefully following instructions in the modules provided. These modules possess the features characterizing most self-instructional materials. They include operationally stated instructional objectives, pre- and posttests, carefully worded instructions, and so forth. Peer-mediated instruction is aimed at developing skills in working cooperatively and increasing each child's skills in supervision. This is actually a programed system of managing learning.

While doing assigned exercises or activities, children are supervised by their peers. Hence, in a period for such an activity, children are paired randomly and for half the period one assumes the role of a tutor while the other the tutee. The tutor supervises the tutee in doing the assigned work with the help of a tutor's guide that contains answers or solutions to the exercises. The tutor also is responsible for keeping an accurate record of the tutee's learning progress for that session. Halfway through the period, whether the tutee has completed the assigned work or not, the pair exchange roles. The former tutee now becomes the tutor, and PMI continues till the end of the period.

During the first phase of the project, materials only for standards 1, 2, and 3 will be developed and tested. As this phase is of immediate concern to us, in the following sections we will discuss issues pertaining to this phase.

Research Design: The Inspire Curriculum Package

The curriculum package can be seen in terms of two types of materials:

- Those for the teacher and the children that serve to guide the teaching-learning processes and
- Those for the teacher that inform him, or her, of the general principles and the recommended management procedures.

Among the first type are the programed teaching guides, booklets to guide peer learning, self-instructional modules, and complementary aids. PTGs are to structure the teacher-mediated instruction through a flexible mode of programing of the instructional procedures consistent with the principles described earlier. The PTGs will be based on units of instruction that last 30-40 minutes. The booklets for guiding peer learning will reflect the peer interaction envisaged in the project — pairs of children working together in a structured way that provides a meaningful learning experience. Although many variations within the framework of dyadic interaction will be included, a characteristic feature of all such situations will be that one student will be a poser of problems and the other a respondent. The poser of problems will be furnished a set of problems as well as a list of the most appropriate responses. The booklets will also contain instructions as to when to change roles and how to conduct oneself in a particular role. Self-instructional modules are designed for independent learning. They will be structured in a manner consistent with the principles of learning outlined earlier. The child will be told what he or she can achieve by studying the module and how to master the content. A posttest, or something equivalent to it, will provide feedback on the degree of mastery he or she has attained and will indicate the child's readiness to start another module. Accompanying the modules will be carefully structured record sheets that will be utilized by the child to chart his or her progress.

The instructional materials will require carefully designed teaching aids that structure complex information. They will include wall charts, isolated pictures or photographs, picture decks, flash cards, prerecorded

tapes or talking cards, semifinished materials for construction activities, wooden blocks, number lines, etc.

Among the second type of materials in Project Inspire are a set of booklets informing the teacher about the basic principles of the project and effective implementation of the recommended procedures; syllabus programs; block tests; record sheets; and work sheets. The booklets will focus on the concept of mastery learning from the cognitive perspective and what it entails in terms of teacher tasks; the ways of structuring a stimulating learning environment; ways of managing effectively the resources made available; flexibility within the context of programed instruction; the art of questioning and other uses of language; what should be done to facilitate retention and recall of information on the part of the children; and the compensatory and remediation activities. These booklets will be carefully designed so that they will be within the level of comprehension of the primary schoolteachers.

The syllabus programs will structure the subject areas prescribed by the Ministry of Education into topics of a size suitable for the units of instruction (30-40 minutes). The topics will be sequenced so that there is a proper order in the acquisition of skills, assimilation of concepts and general principles, and the development of recommended habits. In addition to the topics, the syllabus programs will specify the objectives of each lesson and general outlines of the teaching procedures most suitable for attaining the objectives. Additional notes will be included when deemed relevant. Each subject will have a syllabus program that will cover a year, comprising three terms of about 13 weeks each.

The block tests will be administered by the teachers after completion of a sequence of instructional units that have a structural unity. They will be partly diagnostic and partly evaluative. Two kinds of block tests are envisaged — short sequence and long sequence.

Record sheets will be used by the teacher to monitor each pupil's progress and will be the basis for progress reports to the parents, whereas the work sheets will contain supplementary exercises to be done by the children as reinforcement activities. They will be distributed and marked by the teachers but returned to the pupils to be filed and retained.

TESTING THE PACKAGE

The materials will be pilot-tested in six rural schools, three to be located in the state of Perak and three in Penang. On the basis of feedback, these materials will be revised, where necessary, once only. There will be no control schools during this pilot stage, and visits made by the officers of the project as well as other forms of interaction between project and school personnel will not be rigidly structured. The overall objective will be to obtain various forms of feedback so that the materials can be improved and can effectively contribute to the objectives of the project.

After the pilot stage, the testing of the complete package will begin so that we can assess its impact and measure its effectiveness in bringing about the intended objectives. During this second stage there will only

be utilization — no revision — of Inspire materials by a number of rural schools under different conditions. The independent variable will be the Inspire curriculum package along with different modes of introduction and utilization. There will be three modes of introduction: the package alone; the package with a training course for the teachers implementing it; and the package, training course, along with intensive supervision by school organizers and inspectors.

The training course is conducted by the project staff and lasts 3 days, during which the basic principles of managing the Inspire instructional package are explained and discussed. The curriculum content is to be elaborated and the various proposed instructional strategies are to be demonstrated to the participants — project teachers, district organizers, and inspectors.

Two kinds of people are involved in intensive supervision: the inspectors and the district school organizers. Each will make about one trip a month to visit the schools independently. Their tasks are:

- To ensure that the PTGs are followed. Teachers should not be allowed to omit PTGs or even omit steps within the PTGs. All instructional and learning activities must be carried out within the time schedule allotted for them.
- To clarify issues that are not clear to the teachers and assist them further in understanding the concepts that the project is emphasizing, such as the providing of feedback to the children and assessing the attainment of various kinds of objectives as a standard feature of teaching.
- To ensure that the block tests are given by the teachers and the marks are made available to the project staff. If there are any weaknesses in the attainment of the objectives, the inspectors and district supervisors should assist the teachers to come up with ways to achieve the objectives.

METHODS

Altogether, there will be 21 schools in the testing — 12 experimental and 9 control. Of the 12 experimental schools, 3 will receive the package alone; 6, the package with teacher training; and 3, the package-training-supervision combination. Of the six schools testing the package-training combination, three are those in Perak that tested the standard 1 package during the pilot phase. They will begin the pilot phase for the standard 2 package, as will three schools in Penang that are testing the package-training-supervision combination. The following year, the standard 2 materials will be tested fully in the experimental schools, and pilot-testing will begin for standard 3 materials, and so on.

On the basis of some general characteristics such as geographical location, size, and socioeconomic background of students, nine other comparable schools have been selected to be the control schools. To ensure that the pupils from the control and experimental schools were at comparable cognitive levels, the project team prepared an entry-behaviour test, which was administered to all the standard 1 pupils. The instrument was modeled on a similar kind of test produced by Innotech (Regional Centre for Educational Innovation and Technology, Manila).

It is hoped that the curriculum package will bring about increased achievement in learning and a number of other behavioural and attitudinal changes among the teachers and the pupils. Briefly, comparisons will be based on the pupils' behaviour and achievement; the teachers' behaviour; and the classroom atmosphere.

Assessment of the Academic Performance of the Pupils

We formulated two substantive hypotheses about improvement in academic performance:

- Children attending the experimental schools will achieve higher scores in evaluations by the Ministry of Education and by the project than will those in the control schools.
- Children learning under the project's programed system of instruction will exhibit more (and better) skills specified in the preestablished objectives for learning effectiveness than will children in the control schools.

Learning effectiveness refers to the degree to which pupils acquire, through suitable learning experiences, the skills and attitudes specified in the preestablished objectives for effectiveness and efficiency.

A comparison of performance of pupils in experimental and control schools with respect to the prespecified skills and attitudes is planned as a measurement of relative effectiveness of the experimental approaches. Evaluation instruments are the government-administered diagnostic tests and assessment examination as well as Project Inspire's evaluation instruments to be administered periodically.

Learning efficiency takes into account the saving of time and effort on the part of the learner. It is the ratio of the mean for a pupil's performance in any subject area to the time required to achieve that performance.

Assessment of Pupil Behaviour

A number of nonacademic aspects of pupil behaviour will be important markers of the success of the project. These pertain to independence and self-management in learning, systematic thinking in problem solving, creativity, consideration for others, cooperation, self-confidence, and interest in learning. The specific hypotheses pertaining to pupil behaviour are:

- As a result of the project activities, there will be a strengthening of independence in general behaviour of the children in classrooms of experimental schools.
- The children in experimental schools will demonstrate greater creativity than do those in control schools.
- Children in experimental schools will have greater motivation to learn than will children in control schools.
- Children in experimental schools will have greater motivation to achieve than will their counterparts in control schools.

Independence in learning is an attitude emphasized in the project. It is hoped that an instrument such as the Beller Child Dependency and Independence Scales or something similar will enable the effective testing of the hypothesis on independence. This instrument, to be scored

by the teacher, provides two measures: the dependent and independent or autonomous behaviour. Dependency is measured through a scoring of the frequency and persistence with which a child seeks help, recognition, physical contact, and proximity to adults. The scale for independence measures the child's initiative, satisfaction in work, independence in performing routine tasks, success in overcoming obstacles, and ability to complete activities.

The capacity for creative thinking is encouraged extensively in the project. The three instruments chosen to gauge objectively the project's impact on this dimension of cognitive functioning are a creativity attitude survey, the Southern California Tests of Divergent Production, and the Torrance Tests of Creative Thinking.

This first instrument assesses a child's creativity by requiring him or her to respond to 32 statements covering five dimensions normally associated with creativity — confidence in own ideas; appreciation of fantasy; theoretical and aesthetic orientation; openness to impulse expression; and desire for novelty. The second instrument provides a battery of tests of divergent thinking and presents various tasks requiring creative and original problem solving. The third is a more comprehensive measure of creativity in children, and it will be used periodically as it allows the determination of changes in children's creativity.

Good motivation toward learning and achievement is another attitude that is desired by the project. The Junior Index of Motivation assesses the child's motivation toward school. In this instrument, school-related motivation is assumed to represent an internalized state of being that manifests itself through particular behaviour. Such an assumption is consistent with the cognitive learning principles that are presupposed by the project. Achievement motivation will be assessed by the instrument Animal Crackers. This instrument is based on the premise that a young child's success in school depends on both intellectual ability and motivation to learn. Animal Crackers focuses on five aspects of achievement-oriented behaviour that are not attributable to intellectual ability.

Measurements Related to Teacher Behaviour

There will be three different sources of information on teacher behaviour and attitude:

- The teachers themselves;
- The pupils taught by the teachers; and
- Observers — either project personnel or others.

It is basic for the success of the project that the teachers behave during the instructional process, as well as outside, in accordance with the principles laid down by the project. Their teaching styles, attitudes toward the pupils, ideology of classroom control, and assumed roles will be the focus of attention in the collection of data pertaining to teacher behaviour.

The general hypothesis, which will be tested during the second phase of the project, will be that instructional behaviour of teachers in the experimental schools will be different from that of teachers in the

control schools so that the former will conform with the prescriptions of the project. Instruction refers to what the teacher does in the process of learning as well as to what the teacher does in the process of management of learning. Different means change. In particular, it is the change from the conventional practices of teachers and pupils during instruction to that expected and specified by the project's programed system of instruction. Operationally, it is the qualitative (descriptive) comparison of the teaching-learning-management behaviour of teachers and pupils before and after receiving the curriculum package or its combination with training or supervision and training. The general hypothesis generates a number of specific hypotheses for which there exist suitable instruments for the collection of data and analysis. We can distinguish two sets of more specific hypotheses — one set related to instructional performance and another to the attitudinal or ideological aspects:

- The instructional performance of teachers in experimental schools will be distinguished from that of teachers in control schools by their awareness of clearly formulated objectives for each instruction; the pacing of reinforcement or knowledge of results; the choice of strategies for attaining the intended learning objective; the sequenced presentation of information; the information presented (transformed to facilitate retention and transfer); the encouragement of achievement and self-management of learning; and the classroom climate encouraging self-expression by pupils.
- The teachers in the experimental schools will be more effective in their attitudes toward students and in their interpersonal relations than will the teachers in control schools.
- The teachers in the experimental schools will be more humanistic and less authoritarian than will be teachers in control schools.
- The teachers in the experimental schools will be more inclined to encourage independence in learning than will the teachers in control schools.
- The teachers in experimental schools will see themselves more as advisers, motivators, and resource personnel than as information givers and authoritarians.

The first hypothesis will be assessed by the Project Inspire Mode of Video Tape Analysis of Teaching Performance. Teaching performance in a variety of activities will be videotaped. In the analysis of the videotape, we will be making the basic assumption that any behaviour is an execution of a plan (or a program), and, hence, an instruction of a teacher is also an execution of a program. So the essential feature of the analysis will be the reconstruction of the underlying program of a teacher during instruction based on the overt and nonverbal behaviour of the teacher. It is this program that will be subjected to further analysis so that a profile of the instructional style can be constructed. This profile of teaching styles will be compared with the norm conceived by the project. Where the profile is consistent (80%) with the norm, the teaching style will be said to be that proposed by the project.

Another instrument to assess the first hypothesis will be developed; it will be modeled on the Corner-Eisenberg Observation System. First,

observers clarify teacher behaviour episodes to communication, management, and encouragement. Second, they record the degree to which teacher activities promote development of an adequate self-concept, emotional stability, and a sense of security; intellectual growth; personal responsibility for private or community property; cultural habit training; consideration for others; achievement; development of physical abilities and skills; creativity; and obedience and self-control. Third, observers make overall judgments of teacher performance, ranking the teacher on 6-point scales for warmth versus coldness; permissiveness versus restrictiveness; encouragement of an active versus a passive attitude; and variety versus nonvariety.

To validate the second hypothesis, we needed an instrument that would measure attitude indicative of a teacher's effectiveness in interpersonal relations with pupils. An instrument modeled on the Minnesota Teacher Attitude Inventory is deemed suitable. The criteria used in this instrument — the ability to win the affection of pupils; fondness for and understanding of children; ability to maintain a desirable form of discipline — will enable the effective testing of the hypothesis.

The instrument to be developed to test the third hypothesis will be modeled on the Pupil Control Ideology Form. This instrument assesses whether a teacher has an authoritarian custodial or a more humanistic ideology toward classroom or school organization.

The instrument to be developed for data collection and analysis of the fourth hypothesis will be based on Attitude Toward the Freedom of Children Scale. This instrument measures teachers' opinions about the degree of freedom, independence, and self-management that children should be allowed. The project assumes that the teachers are at present not sufficiently liberal and that, as a result of the principles laid down by the project, they will become more liberal toward their pupils.

The project emphasizes the redefinition of the role of teachers for the efficient implementation of the integrated system of programed instruction. The fifth hypothesis is related to this issue and will be assessed by the Teacher Practices Questionnaire. This instrument defines the teacher's role expectations using the categories: adviser and information giver, counselor, disciplinarian, motivator, and referer.

In view of the changed roles recommended by the project, these measurements are deemed very important. It is hoped that as a result of the project the roles of motivator and referer will be given greater weight.

Measurements Related to the Classroom Atmosphere

One of the manifestations at the level of group behaviour of the successful implementation of the project will be the general atmosphere of the classroom and group dynamics. We have formulated two hypotheses regarding this aspect of the impact of the project:

- In group characteristics such as autonomy, control intimacy, permeability, potency, etc. the experimental group will be better than the control group.
- The climate in the experimental classrooms will be more conducive to learning than the one in the control school.

The instrument chosen for testing the first hypothesis is the Group Dimensions Descriptive Questionnaire. This instrument will enable the characterization of groups on autonomy, control, flexibility, hedonic tone, homogeneity, intimacy, participation, permeability, polarization, potency, stability, stratification, and viscidity.

The instrument to be developed for testing the second hypothesis will be modeled on Your School Days. This instrument measures classroom climate from the pupils' point of view. The four factors that will be available for evaluation are enjoyment, positive reinforcement; unhappiness, misbehaviour; cognitive emphasis; and variety, individualization. On all these factors, the experimental classes should be significantly better than the control classes.

These evaluations are viewed as essential for a project that aims to improve education for rural children in Malaysia. Their academic performance and satisfaction as well as their motivation and creativity are the keys to a better life.

Teacher Training for SAGE, a System of Individualized Instruction

We at the Institut national de la recherche scientifique (INRS) firmly believe that no major educational innovation can adequately be developed without researchers entering in close partnership with teachers and other school personnel and that, once it has been developed, it cannot be implemented or disseminated unless the professionals who will be working with it undertake some form of reasonably effective training.

We also believe and act on the principle that teachers and other school personnel who have had some field experience do not have to unlearn what they have picked up during college or university training to move from group to individualized instruction. In fact, we believe that from 3 to 6 credits, that is from 135 to 270 hours, would prove enough to train certified teachers and other school personnel in the use of SAGE.

NATURE OF OUR WORK

In the area of teacher training for SAGE, our work has been essentially curricular and developmental. We have not conducted any formal piece of research on, or quantitative formal evaluation of, our training sessions. This is not to say that our work has been unscientific or unscholarly. We rather had recourse to qualitative evaluation, using feedback given and needs expressed by teachers, both during and after training, to reexamine the nature and sequence of the learning objectives as well as the teaching-learning materials of our training program.

The most basic objective of our teacher training is to provide teachers and educational personnel with as complete an experience as possible of individualized instruction. Individualized instruction requires a change of mind among teachers — a change that will enable them to enact new roles and to master new techniques.

A change of mind. Basically, the teacher has to come to believe that school success or high achievement in academic subjects is possible for most learners; that even a young learner is capable of assuming responsibility for the effective management and use of his or her school learning time; that group instruction — e.g., teaching 25 or 30 students the same unit at the same time and pace — is fundamentally a mission impossible for one who aims to bring all learners to a high level of achievement.

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To enact new roles. The typical teacher, during group instruction, provides information, asks questions, receives answers, and provides feedback. He or she hardly has time for personal academic counseling or for tutoring. In an individualized instruction setting, the transmitting of information is done by teaching-learning materials; most of the questions and formative feedback also come from these materials. The teacher becomes, ideally, a diagnostician, a tutor, an academic counselor. He or she meets with individuals much more than with large groups and, because of the variety of learning materials available and of the individual programs of studies, has managerial duties much different from those imparted to a teacher in the regular classroom.

To master new techniques. These include new ways of grading tests, new ways of evaluating learning performance, new ways of dealing interpersonally with individual learners, new ways of managing the heavy "traffic" within an individualized setting, new means for answering as soon as possible the various needs of individual learners.

We aimed to ensure that teachers and other school personnel, preparing themselves to implement SAGE, experienced, as thoroughly as possible, individualized instruction. So, during the training sessions, we try as much as possible to avoid large-group instruction or lectures; to provide the trainees with diversified learning materials; to make available human resources; to give them maximal control over the use of their training time and, if not always the content, at least the sequence or ordering of their learning experiences. In so doing, we hope to have the trainees experience and discover by themselves both the limits and the benefits of individualized instruction.

Five Developmental Stages In Our Program

From 1973 to 1981, our training program has evolved through four stages and should reach a fifth and final stage in 1982. During 1973-74 and 1974-75, five elementary schoolteachers, the director of their school, and his assistant director, along with one professional of their school district were fully integrated into the research and development team of INRS-Education responsible for the reformulating of the French-language curriculum, the developing of the first hundred or so teaching-learning units and accompanying tests, the preexperimentation with the system (spring 1974), the overseeing of the first full year of experimentation (1974-75), and the collection of data on the teaching-learning units being used for the first time as well as on the first run of the system as a whole.

During the first 2 years, there was no formal training, but we believe that the training sessions will never give as much to the trainees as did the all-directional partnership with the original participants.

During 1975-76, negotiations with two other school districts for the implementation of SAGE in either 1976-77 or 1977-78 focused clearly on the need for formal, systematic teacher, and other school personnel, training. We could no longer maintain the pioneer way of training to which we had resorted in 1973-74 and 1974-75: the school boards could not afford to allow the long paid leaves of absence that had been given

the early participants in the program. One school district, 200 km from Quebec, was planning to open some 20 SAGE classes; the developmental work at INRS-Education, under way for 2 years, had become too complex for a large group of outsiders to join suddenly and profit from, and we did not have the capability to accommodate that many people in our R&D team.

We scanned the literature on teacher education in the hope of finding some accurate published materials to use, totally or partially, for a first formal training session scheduled for summer and fall 1976. We finally decided upon buying the whole package published by Westinghouse Learning Corporation (1975) entitled *Designs for Individualization*. This package comprises an administrator's handbook, a teacher's handbook, and a series of audiocassettes and filmstrips.

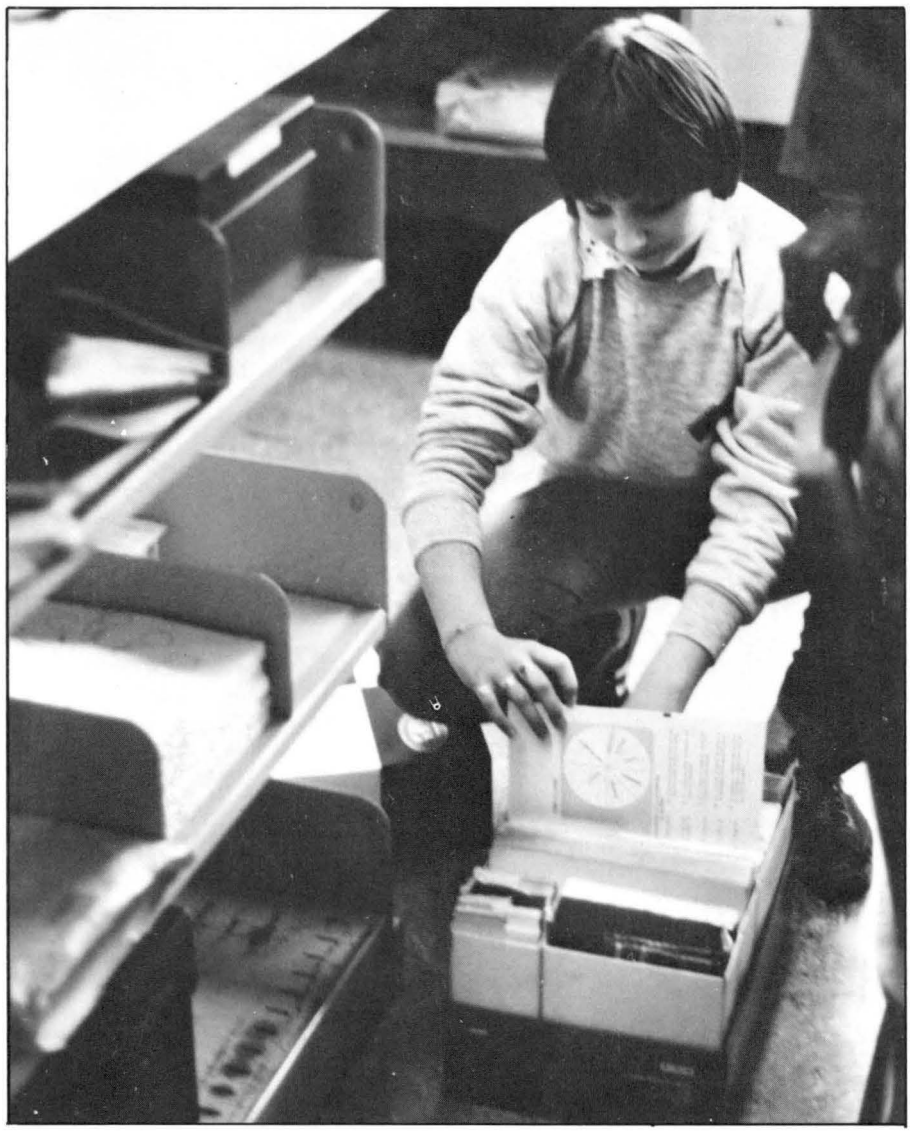
After having closely examined this package, we felt that 13 of the 15 teaching-learning units[1] of the teacher's handbook could serve as core material for a teacher training session if two shortcomings of the package were overcome. The first shortcoming was that it was written in English. Most of Quebec's elementary schoolteachers are not bilingual and for most of them to use a textbook written in English is a real burden. If we were to use the package, we would have to translate the 13 units that we felt were relevant and obtain the permission to do so from the Westinghouse Learning Corporation. Another shortcoming of the package was that it was not fitted perfectly to SAGE, or rather to the Quebec milieu. There was no specific objective or teaching-learning unit on our French curriculum, our math curriculum, our English as a second-language curriculum, or our computer programs.

We asked the director of Les Presses de l'Université du Québec (Quebec State University Press) to negotiate with Westinghouse Learning Corporation the right to translate and adapt the teacher's handbook; then we began making a "home" translation of the 13 relevant teaching-learning units; and finally we set out to develop the four needed teaching-learning units specific to SAGE. Letters were exchanged between Les Presses de l'Université du Québec and Westinghouse Learning Corporation, but final agreement was never reached.

The decisions on how to proceed had been made in early spring 1976, and all except the first one came to fruition in time for the summer-fall session of this year. The teaching-learning materials adapted from *Designs for Individualization* are no longer in use at INRS-Education but proved useful during 1976-77 and 1977-78.

In fact, this translated, adapted, extended package served as the main pedagogic resource for six training sessions from June 1976 to August 1978. These sessions were attended by some 100 teachers, school directors, and other education personnel; three took place in Ste-Foy at INRS-Education, two in St-Bruno-de-Montarville near Montreal, and

[1]Based on our experience of 1973-74 and 1974-75, the two units that we felt were to be left aside were the ones that aimed at preparing teachers to develop by themselves self-instructional teaching-learning units for the pupils. We had tried assigning teachers to part-time developing of instructional materials and quickly realized that this was incompatible with a full-time teaching load. The teaching-learning units in SAGE have been developed by experienced teachers who had resigned or had to resign their duties as classroom teachers.



The student's experience in SAGE — individualized instruction — was translated into the training program for teachers.

one in Normandin (Lac St-Jean). The Conseil des études de l'Université du Québec (Quebec State University Academic Senate) granted us the right to offer trainees three credits at the master's level for satisfactory completion of the training program.

As SAGE matured in the milieu, both theoretically and practically, and as teachers, school administrators, and researchers discovered through experimentation new facets of the system as well as new implementation modes, the teacher training program based on *Designs for Individualization* became rapidly less satisfying. As early as 1977,

the unit dealing with a theoretical overview of individualization had to be completely rewritten to meet the needs of the trainees; the units on the classroom managerial systems and physical arrangements had to be adapted and partly rewritten to reflect the realities emerging from the first experimental tryouts of SAGE.

In September 1978, six INRS-Education researchers undertook to redraw the whole design of our teacher training program, redefining its specific objectives and making plans for writing a complete set of instructional materials geared to these objectives.

During the time required to come up with our own package, about half of the *Designs for Individualization* teaching-learning units used since 1976 continued to be resorted to, and the other half was replaced by tentative draft papers and by lecturing. We felt that relevant lecturing was, for a while, better than the available, less relevant, self-instructional materials.

Therefore, the third stage of our teacher training program was characterized by a mix of our inputs — written and oral — and of materials adapted from *Designs for Individualization.*

There have been five sessions during this transitory stage, attended by some 50 persons. All these sessions were held between March and August 1979, and, for the first time, not all were chaired by staff members of INRS-Education. Two were run by school principals who had previously attended a training session at INRS-Education.

In the fourth and current stage of the training program — when we will use our own package — dissemination problems prevented us from holding training sessions for 2 years, that is between August 1979 and March 1981.

During the first 13 months of this latency period, the writing of our own instructional package for the training of teachers in the use of SAGE was slow but steady. In October 1980, a team of five researchers of INRS-Education agreed to give priority to the task of completing as much as possible of the package for a training session in March-April 1981.

Building on the work already done in late 1978, we proceeded to a last revision of the definition and of the structure of the program's specific objectives. This led to a program ordered around eight themes, or dimensions, comprising 24 objectives.

In our view, the eight themes or dimensions of the programs are those that a prospective user of SAGE must face if he or she is to be considered minimally trained in the use of this system of individualized instruction. These dimensions comprise the theoretical grounding of SAGE; the instructional tools for individualizing the teaching-learning process (curricula, teaching-learning units, tests, and other evaluation devices); the learner's individual program of studies; the teacher's role; the learner's role; the managing of the classroom; the physical setting of the classroom; and the observing of one, or more than one, real SAGE classroom.

As of 1 May 1981 the teaching-learning units, evaluation devices, and other instructional resources required for pursuing 14 of 24 specific objectives of this new training program have been produced and are accessible to those interested.

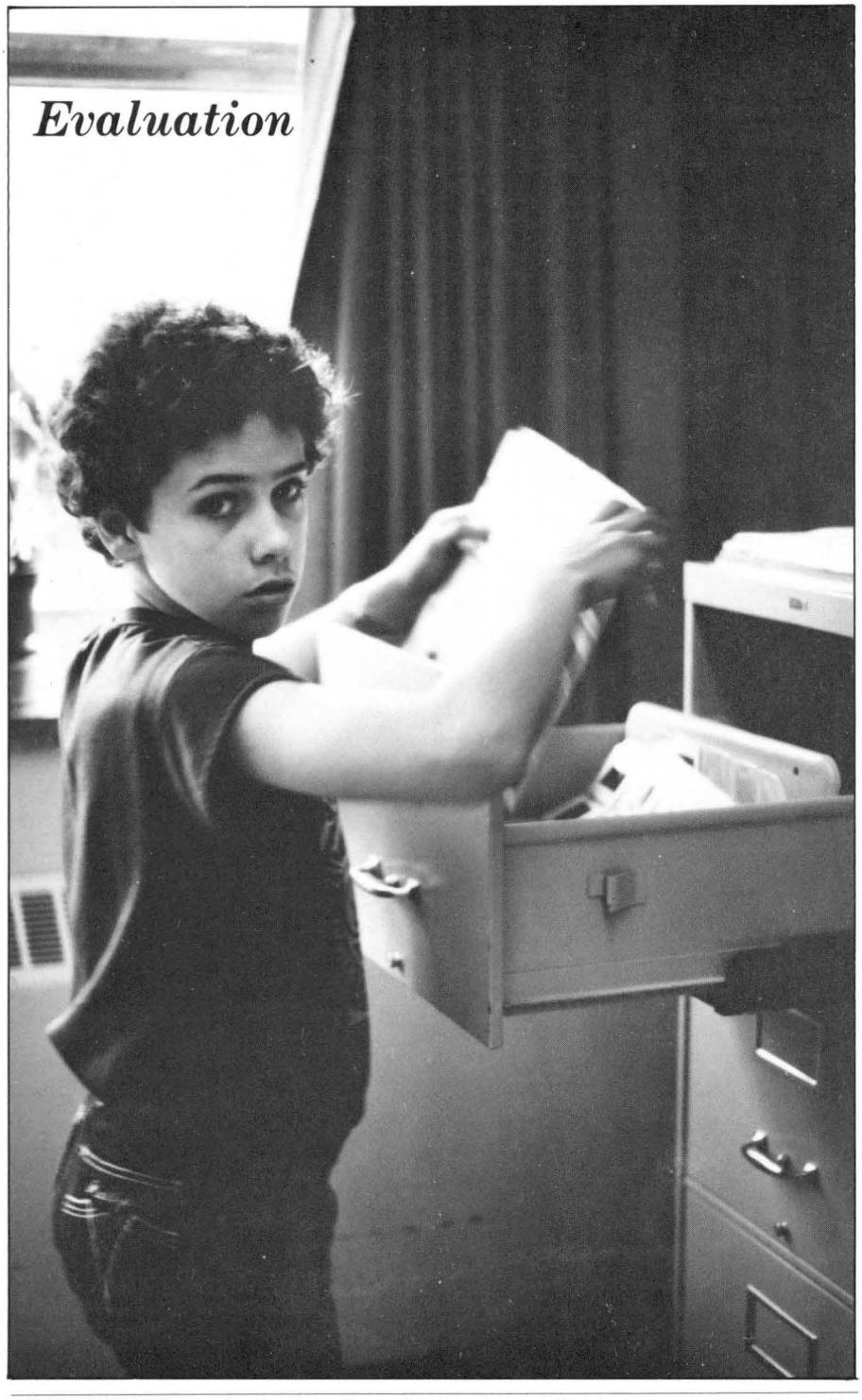
We plan to add one more theme or dimension to the eight already identified in our own new teacher training program. This theme will deal with the first weeks of implementation of SAGE in a classroom and should be operationally defined through two or three objectives.

We hope to construct, and have ready for publication by the end of 1982, the instructional materials — both paper-and-pencil and audiovisual — needed to pursue the 10 objectives that have been identified within the eight present themes as well as those required by the ninth envisaged theme.

SUMMARY AND CONCLUSIONS

Developing the learner's autonomy and sense of responsibility is a fundamental objective of SAGE. *Mutadis mutandis*, it is an objective that we also pursue with regard to our teacher training program. We aim at making this program self-sufficient — autonomous, self-instructional. And we would like it to be flexible enough to allow professionals in the field to adapt it to their own needs without compromising its basic requirements, or, in other words, we wish our program to encourage its users' sense of responsibility.

Our training program evolved from a close partnership, which was a sophisticated form of dependency, as it required the continuous presence and action of INRS-Education staff members through two developmental stages when adapted published materials were complemented by inputs from INRS-Education. These materials allowed not only university professors but also school principals to assume responsibility for training prospective users of SAGE with minimal or even without any direct help from INRS-Education. Now, we are not far from attaining our objective of "autonomy and responsibility." With the fourth stage providing more than half of the training package suited to the peculiarities of SAGE and the next stage planned to be entered into as early as 1 June 1981, we may realistically hope the teacher training program with regard to SAGE to be, in a year and a half from now, fully self-instructional.



The student's role in SAGE: how does one quantify the process and effects?

An Evaluation of the Role of Students and Teachers in a Class Using SAGE

Will the introduction of SAGE in the classroom change the behaviour of students and teachers? Will the roles of SAGE teachers and students be different from those of students and teachers in a class where instruction is "collective," i.e., most often given in the same way to all pupils in the class as a group, the assumption being that everyone starts at approximately the same point, progresses at the same speed, and sees the same part of the program at the same time? These were questions my colleagues and I asked ourselves during the period of development of a design for evaluating SAGE. Among other things, we hypothesized that:

- Students in the experimental group (the one using SAGE) will spend more time working alone, in small groups, interacting with a peer, preparing their program of studies, and learning strategies in transitional activities and less time in large groups than will students in the control group;
- The teacher in the experimental group will spend less time in large-group interaction and more time interacting with individual pupils, with small groups, and in management activities than will the teacher in the control group; and
- The teacher in the experimental group will spend more time than the teacher in the control group on didactic and diagnostic enquiry, on decision facilitating, leading the discussion in a small group, tutoring in a small group, giving positive verbal and non-verbal messages and less time giving solutions, lecturing in a small group, managing learning equipment and materials, and managing student activities.

When we formulated these hypotheses, we knew they were operational, and we believed we would be able to get behavioural measures empirically to verify the assumptions and eventually to show significant differences between the experimental and control groups. Indeed these hypotheses were a way of putting into operation individual instruction, a concept we had borrowed from PLAN (Program for learning in accordance with needs). The authors of PLAN defined individual instruction according to three instruments. The first instrument covered the training material used to prepare teachers to institute a system of individual instruction (Westinghouse Learning Corporation 1975). The second instrument is an observation scale for coding student behaviour

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in class (Lipe and Steen 1975), and the third, an observation scale for the teacher's behaviour in class (Steen and Lipe 1975).

We had to translate these instruments and adapt them to our needs and culture. They had been taken from the U.S. where research in education is much more advanced than in French-speaking Quebec and in the French-speaking countries in general where there is often a poverty of personnel and funding. In 1981, we began putting into circulation the material we developed for training teachers to institute an individualized instruction system (Leclerc 1980).

Once teachers had been trained to use SAGE (in 1974-75, thanks to the fact that they worked closely with us and afterward participated in a training session), we needed to determine whether they actually instituted a system of individual instruction in their classes. Was this method clearly different from the so-called collective method in terms of the students' and teachers' roles? To answer this question, in 1974-75, we set up an evaluation study closely modeled on PLAN (Leclerc and Turcotte 1976a). We used the two observation scales for recording student and teacher behaviour in the classroom. We had an experimental and a control group, each composed of five classes; there were four classes of 9 year olds, four classes of 10 year olds, and two classes of 11 year olds, giving a total of about 300 students. Using videotapes, we recorded three teaching situations in each class, and for each class we kept as data the first 15 minutes of the recording made at the beginning of October, the middle 15 minutes from the December recordings, and the last 15 minutes from the April recordings. Thus, in total, the data comprised 450 minutes or 7.5 hours of instruction. Once the instrument had been translated and interobserver agreement ascertained, the data were analyzed by two observers simultaneously (Leclerc and Turcotte 1976b).

The passage of time makes us think that we did interpret the results correctly when we said that they confirmed what visitors could see for themselves upon entering a class — that is, SAGE really did allow instruction to be individualized. We wrote: "The fact of providing the five teachers in the experimental group with all the necessary back up (i.e. equipment, written and audiovisual material) made possible the individualization of instruction — that is to say, it allowed students and teachers to spend a good part of their time (in the classroom) interacting on a one-to-one basis (student and teacher), working alone, and to a lesser extent, permitted more student interaction with a peer" (Leclerc and Turcotte 1976b:68). We also wrote: "It seems to be possible to introduce a new system into the schools, a system which relies more on individualized rather than collective instruction" (Leclerc and Turcotte 1976b:69).

Our observations in the classrooms in 1975-76 assured us we would get the same results as in 1974-75; we reduced the number of observations to one from the three we had in 1974-75, in each of the classes in the experimental and control groups (Leclerc and Turcotte 1976b:38).

It was for this reason that we used a different technique for evaluating SAGE the same year (1975-76) (Leclerc et al. 1976). The Stanford Research Institute Classroom Observation Instrument — SRICOI — seemed to meet our needs (Stanford Research Institute 1974).

We kept six variables for study. We thought we would, in fact, find more "independence," "task persistence," "cooperation," "verbal initiative," "self-esteem," and "questions to adult" in students in the experimental group than in those of the control group. The definitions of these variables are those of SRICOI.

As with the two observation scales we had borrowed earlier, we had to translate this instrument before using it and conduct a training seminar for observers — and ensure a high degree of interobserver agreement — before collecting data in the classroom. In all, we selected 10 hours of observation from 12 classes of the second cycle of elementary school. Of these, four were classes of 9 year olds, four of 10 year olds, and four of 11 year olds.

Each period of observation included:

- Observation of the teacher for 5 minutes;
- Observation of four students for 5 minutes each; and
- For each period of 5 minutes, a kind of "snapshot" description of student activities as if a photograph of the class had been taken before the 5 minutes of observation.

Thus every teacher was observed twice, each time by a different observer (2 × 5 minutes); 96 randomly selected students were each observed for 5 minutes (8 students × 12 classes × 5 minutes); and 120 "snapshots" of classroom activities were taken. Each observer had eight observation periods to complete.

Using the Mann-Whitney U test, we compared the data and found that the control and experimental groups were significantly different in terms of student independence, task persistence, and cooperation, this last, however, being the opposite of what was expected (Begin et al. 1976).

We were only partly satisfied with our results. Undoubtedly we should have increased both the number and length of the observations significantly. In 1976-77, however, we used the same methods to evaluate student and teacher behaviour in class, i.e., student and teacher observation scales and SRICOI. For a number of reasons — lack of funding and personnel, a new setting for the experiment (i.e., a new school, school board, new low-income neighbourhood), a smaller number of classes (there were only two classes where SAGE was being tried out) — we collected observational data in three classes only, two experimental and one control. "Data collection comprised, on the one hand, a videotape of instruction of a half hour's duration per class; these recordings were later analyzed according to the observation scales and, on the other, the use of the SRICOI on two separate occasions in each class. In the case of SRICOI, the observer randomly chose five students on each occasion, and each was observed for 5 minutes" (Leclerc and Turcotte 1976b).

In large measure, the results are congruent with the results from 1974-75 and 1975-76 (Leclerc and Turcotte 1976b). The results of the observations clearly indicated significant differences between groups where instruction was individualized and those where it was collective. As well, students seemed to be much more independent (they are not dependent on the adult in class) in the individualized setting than in the so-called collective one. As far as task persistence and cooperation are

concerned, the results seemed to be contradictory: one year there was a difference, the next not; or the difference was negative one year and positive the next.

In 1976-77 we summarized our observation work according to our hypotheses: "In short, instruction in SAGE classes has been individualized, that is to say, students take charge of their learning activities in the sense that they are freed from the large group to work either alone, with a peer, or in a small group. . .; teachers spend more time interacting with individuals and small groups. . .; they spend less time lecturing and more time guiding and encouraging students, and checking and facilitating learning. . .so that we observe more student independence and cooperation. . ." (Leclerc and Turcotte 1976b). Thus we had come to the end of this phase and were ready for a new stage.

We wanted to go from what we called a general analysis (i.e., instruction has been individualized if we define individualization in a certain way) to a specific analysis (could we verify the degree of student independence, task persistence, and cooperation with greater accuracy?). We wrote that, in 1977-78, still within the framework of the evaluation of SAGE, we wanted to limit our observations of student behaviour in class to three rather than six variables in order to get better results. These were variables borrowed from Stallings' SRICOI (independence, task persistence, and cooperation), the borrowing being for definition and operation. Moreover we wanted to simplify what we saw as a rather complex instrument and, in so doing, to reduce the sources of error. Thus by concentrating on these three variables, we hoped to come closer to reality (INRS 1980:279).

We no longer asked ourselves whether there was a significant difference between the experimental and the control groups as far as individualization was concerned. In our opinion we had answered that question. There was a significant difference. In 1977-78 we were wondering whether we could trust the findings from the measures of independence, task persistence, and cooperation.

Two observers or judges simultaneously recorded the behaviour of 35 students from classes using SAGE on four different occasions, each student being observed for 5 minutes.

We simplified the observers' task as much as possible. Every 5 seconds, he or she had to choose one of three categories to describe the students' behaviour:

- The student was busy working on an independent learning task (task persistence);
- He or she was busy working with one or more other students (cooperation);
- The student was involved in another behaviour.

We defined independence as working on a task in class without an adult's assistance. We later eliminated this variable from our analysis because in classes with an individualized method, students more often work without being in contact with an adult and because in our data, independence was expressed, not in a frequency, but rather as the number of independent students in the class at each of the predetermined moments of observation.

We expected, perhaps naively, to get positive results. However, we were forced to see that our data were not reliable. Even though the interobserver agreement was very high, the variables (task persistence and cooperation) — as defined and observed — could not be considered reliable in the design we had drawn up because of intrastudent variance or the variation in behaviour from one occasion to another.

We did and still do ask ourselves a lot of questions as a result of this "failure." For example, must a behaviour be stable from one occasion to another to be observable? Or must it occur on certain occasions and not on others? How should occasions be defined? How should they be incorporated into the observation scale? How could task persistence be defined so that it would be stable from one occasion to another? Why is cooperation so seldom seen in class? How valid are data that are the sum of frequencies of observed behaviour? Or how valid are data that are taken from more occasions than was planned so that a sufficient number of frequencies will be obtained for statistical analysis? Must one observe homogeneous situations on different occasions? Why limit oneself to homogeneous situations (Leclerc et al. 1979)?

CONCLUSION

Successive evaluation studies have given our work a certain objectivity and rationality. We wanted to provide proof and arguments based on observation and statistical analysis. Funding agencies, parents, and the school milieu needed this proof. Some of our objectives have been realized. The measures we used confirmed the main hypotheses of the project. But our science does not seem to be advanced enough to be able to specify in detail the consequences of an individualized instructional method. No doubt the fault lies in the instruments as well. However, our long and complicated journey has led us, it seems, to ask a number of rather fundamental questions in the field of research on teaching. The questioning of the actual paradigms used in the field of research on teaching is, we believe, another of the uses of this kind of work.

Multiple Outcomes and Perspectives in the Evaluation of Project Impact

In January 1974, Innotech launched the tryout and developmental activities for Project Impact in two field sites in Naga, Cebu, Philippines, and in Solo, Indonesia. The project was envisaged as a solution to the problems of provision of basic education. The problems included the inability to hire enough teachers to meet the ever-increasing school population, the high percentage of dropouts from primary school, and the inability to provide the school population with adequate instructional materials.

During the next 5 years, Project Impact (instructional management by parents, community, and teachers) took shape in accordance with the sociocultural milieu of the two host countries. The model in the Philippines is characterized by:

- An integrated sequence of knowledge, skills, and attitudes that were derived from the country's prescribed curriculum and were translated into programed instructional modules;
- An emphasis on learning-how-to-learn skills;
- Programed teaching by elder pupils in basic literacy and numeracy skills, peer-group learning among elder pupils, and self-instruction for elder pupils;
- Self-paced progress among the learners, who decide when they are ready for evaluation;
- A shift in the teacher's role to that of an instructional supervisor managing the learning activities of some 100–135 multilevel pupils;
- Several assistants to the teacher or instructional supervisor (IS) including an IS aide who is at least an elementary school graduate and who takes care of the routine and clerical functions in the management of learning; a programed teacher, who is an elder pupil who monitors the learning of basic literacy and numeracy skills by beginning learners, using a programed lesson; a tutor, who is a secondary school student and who reports to the learning centre at certain times during the week or month to help in the remediation activities; unpaid community resource persons for specialized skills training; and an itinerant teacher who visits the learning centre once a week to take care of scouting, physical education, arts, and music;
- Within-school groupings, by family, of some 40–50 multilevel

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pupils, one instructional supervisor managing the activities of 2-3 families;
- A flexible schedule of activities;
- An open-door policy for learners who may leave or reenter school any time during the school year with parental permission;
- A policy of positive reinforcement for the learners, the programed teachers, the tutors, the resource persons, and even the parents; and
- Use of management aids such as pupils' weekly contracts, leave-of-absence forms, incentive cards, and pupils' monthly progress cards.

The first batch of graduates from the Naga Impact schools entered the secondary schools in their respective communities in school year 1977-78. In that same year the level 5 and 6 Impact pupils in Naga schools, and in the replication sites in Lapulapu City, Cebu, and in Sapang Palay, Bulacan, together with the control grade 5 and 6 pupils in comparable schools in the three communities, took a national achievement test (Soutele) for grade 6 schoolchildren. The results of the test showed that the Impact pupils were as good as, if not better than, their counterparts in the control schools.

In that same school year, Innotech initiated a cost analysis of the project. Two such studies were undertaken, and the findings showed that the Impact learning system cost 50% less than did conventional schools of comparable size.

Encouraged by the results of the early evaluation activities, Innotech decided to undertake a follow-up study of the performance of the Impact graduates at the secondary level and of the school leavers.

THE STUDY

A 2-year tracer study of the Impact graduates and school leavers sought to answer several questions:

- Are there significant differences in the achievement of Impact and non-Impact graduates (or leavers) in English, Pilipino, and mathematics?
- Is there a significant relationship between achievement and the variables of mental ability, sex, age, and socioeconomic status of the Impact and the non-Impact graduates (or leavers)?
- Are there significant differences in the self-concepts of the Impact and the non-Impact graduates (or leavers)?
- Are there significant differences in the attitudes of the Impact and the non-Impact graduates (or leavers)?
- What are the reasons for leaving school among the Impact and non-Impact leavers?
- What is the nature of the postschool experience of the Impact and the non-Impact leavers?
- What are the perceptions of parents of the Impact learning system, particularly with regard to achievement, self-discipline, personality development, and study habits of the Impact learners?

Hypotheses about the former students were formulated, tested on the basis of the data obtained in the follow-up research activities, and rejected if the differences among the two groups of students were not significant at the 0.05 level of probability.

Basic Assumptions

The assumptions underlying the study were that:

- Teachers' grades are valid indicators of student achievement;
- Differences in the length of pupils' experience in Impact do not cause any significant differences in their achievement, self-concept, and attitudes;
- The students' responses to the self-concept and the attitude questionnaires are accurate and honest indices of their perception of self and of the situations presented to them;
- The interventions that took place during the period from school leaving to the time of the follow-up activities were similar for both the Impact and the non-Impact graduates and leavers; therefore, significant differences in their achievement, attitudes, and self-concept may be due to the differences in their presecondary learning experiences; and
- The data-gathering instruments that I prepared for this study, which have not been submitted to standard validation procedures, would provide data relevant to the questions raised.

The population for the follow-up research activities consisted of secondary school students and leavers who had taken the Soutele test in February–March 1978. The total comprised 375 level 5 and 315 level 6 Impact pupils and 430 grade 5 and 378 grade 6 non-Impact pupils. The intention was to obtain data from the total population; however, this was not possible. Some of the pupils had moved to other provinces and were difficult to follow up. Consequently, of the total 690 Impact pupils and 808 non-Impact pupils, only 483 and 437 respectively, were reached for data. These represent 71% and 54% of the Impact and non-Impact populations.

The Impact and the non-Impact graduates who were contacted were studying under the conventional learning system in their respective communities. Therefore, they were exposed to the same learning experiences and to the same teachers within the same schools.

The Soutele tests were used as a basis for determining the comparability of the Impact and the non-Impact groups. They were prepared and validated by the Ministry of Education and Culture and included a nonverbal ability test, an achievement test for grade 6, an attitude questionnaire for grade 6, and information about pupil inputs. These tests had been administered to the level 5 and 6 Impact pupils and the grade 5 and 6 non-Impact pupils in February–March 1978 upon the initiative of Innotech by an external group consisting of representatives of the Bureau of Elementary Education of the Ministry of Education and Culture.

The academic achievement tests of the Philippine Educational Placement Tests were also used. These included basic learning skills in sequential order required for the grade or year level in three subject

areas: communication arts in English, communication arts in Pilipino, and mathematics.

The test for communication arts in English attempts to assess the students' verbal knowledge, abilities, and skills in word usage, grammar, punctuation, capitalization, spelling, letter writing, comprehension, vocabulary, and effective communication. The test for communication arts in Pilipino measures more or less the same abilities, knowledge, and skills.

The test for mathematics measures the students' ability to deal with numbers. It also attempts to assess skills in using mathematical processes, solving problems, reading, interpreting graphs and scales, and comparing quantities.

As a complement to the tests, I prepared a data sheet, an interview schedule for dropouts, a self-concept questionnaire, an attitude questionnaire, and an interview schedule for parents.

The students' data sheet aimed to gather data on the occupation of parents, the grades of the student for the preceding and the current curriculum years, and the teacher-adviser's ranking of the student in terms of academic performance.

The interview schedule for dropouts was used to gather data on reasons for leaving school; the grade level completed prior to leaving school; the postschool experiences, if any; exposure to media; and job training, if any.

The self-concept questionnaire was actually a series of four questionnaires with similar content: the student's self-report questionnaires, the worker's self-report questionnaire, the teacher-adviser's checklist, and the employer's checklist.

These instruments were designed to measure the subjects' self-concept as reflected by their perception of their physical presentation, of their interaction with the environment, of their interaction with peers, and of their interaction with teachers or employers.

The attitude questionnaire was devised on the basis of the Table of Specifications for the Attitude Inventory in the Soutele instruments. It sought to determine the subjects' willingness to perform roles in the social, moral, and economic development of the group where they belong; willingness to perform manipulative work and similar responsibilities at home and in the community; attitudes toward moral issues, social and economic policies, and practices in terms of public welfare; and attitudes toward independent work. The interview schedule for parents sought to obtain data on the parents' perceptions of Project Impact in terms of their child's achievement, personality development, self-discipline, and study habits.

As a measure of the significance of the differences in the academic achievement of the Impact and the non-Impact students and leavers the *t*-test of correlated means was used; of the differences between the Impact and the non-Impact students in terms of the teacher grades, the *t*-test for two independent groups was used.

To determine the significance of the differences between percentages of the Impact and the non-Impact students' responses to each item in the self-concept and attitude questionnaires, I used the critical ratio test of significance between uncorrelated percentages.

Definitions of the Variables

Individual characteristics of the subjects refer to the mental ability, sex, and chronological age as of March 1981. In the study, "normal" age groups were considered to be 13.5–14.5 for first-year students, 14.5–15.5 for second year, and 15.5–16.5 for third year. Students who were outside these groups were considered either underaged or overaged.

Postschool experiences refer to the jobs that the leavers held from the time they left school until the time they were contacted for the follow-up data. Achievement was indicated by the students' and the leavers' scores in an academic achievement test in English, Pilipino, and mathematics. Attitude was indicated by the students' responses to the statements presented to them in the attitude questionnaire.

Self-concept was indicated by the responses of the students and the leavers, and of the teacher-advisers or employers to the statements on the subjects' physical presentation, interaction with environment, interaction with peers, interaction with teachers-employers.

Findings

There were significant differences in the achievement of the Impact and the non-Impact students in the academic achievement tests in second year Pilipino, at a 0.01 level of probability, and in third year English, at a 0.05 level, in favour of the Impact groups. There were no other significant differences in the achievement of the Impact and the non-Impact groups.

In terms of teacher grades, there were no significant differences in the achievement of the Impact and the non-Impact first-year and second-year students in English, Pilipino, and mathematics; or in the achievement of the third-year Impact and non-Impact students in English. But there were significant differences in the achievement of the third-year Impact and non-Impact students in Pilipino and in mathematics, at a 0.05 level, in favour of the Impact students.

Impact and non-Impact students in first-year secondary school did not differ significantly in their perceptions of their own presentations or their interaction with their environment. However, a significantly higher percentage of non-Impact *vs* Impact students replied positively to the statements "I usually understand when my teacher explains things to me" and "I respect my teachers." In contrast, a significantly higher percentage of Impact students responded positively to the statement: "I can usually finish my work without so much help from my teacher."

Among second-year students, Impact students were significantly more positive about their physical presentation in three of six items: "I try to speak clearly so that others can hear," "I usually pay attention to whatever I do," and "My posture makes me look awkward." Also they were significantly more positive in their response to the statements: "I use books and materials carefully" and "Rules and regulations are necessary for my school," whereas they replied negatively to the statement: "I do not usually return books and materials to their proper places after use" significantly more often than did non-Impact students.

Other significant differences among second-year student responses that favoured Impact students were among replies to the statements: "I usually try to do my share of work in the class," "I like to do things that my teacher tells me to do," "I respect my teachers" (in contrast to the trend among first-year students), and "I do not like to volunteer to do things for my teachers."

It is especially noteworthy that among third-year students, significantly more Impact students again responded positively to the statement "I try to speak clearly so that others can understand me."

Likewise, third-year Impact students again acknowledged the need for rules and regulations in the school and a significant percentage responded positively to "I usually understand when my teacher explains things to me," "I can usually finish my work without so much help from my teachers," and "I respect my teachers," and negatively to "I do not like to volunteer to do things for my teacher." Teacher-adviser assessments painted an especially positive picture of first-year students from the Impact school system. Significantly higher percentages of Impact students were rated positively for the statements: "moves about with ease and confidence," "shows interest in learning," "uses books and other materials carefully," "uses learning materials independently," "returns books and materials to proper places after use," "spends vacant periods doing homework or assigned tasks," "tries his or her best at anything that has to be done," "shows resourcefulness and creativity in group work," and "initiates group activities."

The teacher-adviser assessments for second-year students were also as encouraging, Impact students being rated positively significantly more often for physical presentation and for interaction with teachers. However, the numbers of positive assessments were fewer for the second-year students and were even fewer for the third-year students.

The students' answers to the attitude questionnaire were revealing and favourable in many respects for Impact, significantly more positive responses being received for the statements: "If the neighbors threw a dead rat into the street, I would tell them to pick it up and bury it," "If the principal asked the students to evaluate the performance of their teachers, I would make an honest evaluation," "If my group finished the work earlier than other groups did, I would volunteer to help them," "If an old woman had difficulty in getting into the passenger jeepney, I would help her," "If the class put up a community project and the problem is the money to get the project started, I would ask the group to discuss ways of raising funds for the project," "If the teacher returned a theme with comments to improve it, I would inquire on how best to improve it," "If I came home and found there was no water in the jar, I would go and fetch some," and "If my sister or brother were supposed to prepare supper for the family but could not come home early for a very important reason, I would prepare supper for the family."

There were three major reasons given by respondents for leaving school, with economic reasons heading the list. Inability of parents to support schooling (37.8% Impact, 32% non-Impact); need to help parents in their work (18.4%, 19.5%); and need to work and earn a living (7.8%, 9%) were the most common. Lack of interest in studies (22%, 28.5%) and

low grades (6.7%, 3.5%) were also factors cited, and marriage (4.8%, 0%) and ill-health (1.9%, 1.7%) were mentioned.

There were no significant differences in the Impact and non-Impact leavers' performance on achievement tests. However, the Impact leavers did have better self-concepts and were judged by their employers to be more creative and more willing to try new techniques than were non-Impact leavers.

The 16 Impact leavers who were contacted during the follow-up activities were engaged as common labourers — nurse's aide, housemaid, workers in a shellcraft factory, storekeeper, helpers in a building construction group, helpers in a welding shop, and farmhands. The 15 non-Impact leavers who were working at the time of the follow-up activities were also engaged as common labourers — jeepney conductors, contractual workers, workers in cottage industries, and farmhands.

There was no way to determine the relationship between the nature of postschool experiences and achievement in literacy and numeracy skills because not one of the "employed" Impact and non-Impact leavers took the academic achievement test administered in December 1980.

The parents who were interviewed in the three Impact sites felt that the Impact system produced better literacy skills and more cognitive learning in less time than did traditional schooling; encouraged leadership traits and the overcoming of inferiority complexes as well as stage fright; and promoted independent study habits and self-discipline.

Some of the parents' comments pointed out their misgivings about the system: many did not believe that pupils could acquire the basic literacy skills from programed teachers; many believed that there could be no substitute for a good teacher, not even the best module; many feared the lack of discipline in the school, with children moving around the classroom at will; and those whose children were slow learners complained that their children were taking longer than the standard 6 years to finish elementary school. There were also complaints that the children did not have an opportunity to acquire speaking skills because they spent too much time reading modules.

DISCUSSION

The findings on the Impact graduates and leavers' performance in academic achievement and their achievement in terms of teacher grades and self-concept have been valuable to Impact field staff. They provide assurance that the developmental activities have not hurt the subjects.

Although the modules in Impact were based on the prescribed curriculum by the Ministry of Education and Culture, the Impact writers had to weed out repetitious objectives and to reorganize them to achieve a more feasible and logical continuum of knowledge, skills, and attitudes. Therefore, there was the risk that the Impact students did not have exposure to the same set of objectives that the non-Impact students did. But the findings on achievement have shown that the streamlined Impact continuum has provided the learners with the basic knowledge, skills, and activities needed for further schooling.

The significant differences in achievement, in favour of the Impact students, serve to confirm the belief of the Impact research groups that peer learning through the modules enhances cognitive learning because the psychologic barrier — the inhibitions present in learner and adult interaction — has been removed.

The positive self-assessment by Impact students and leavers on physical presentation in such items as "I try to speak clearly so that others can understand me," "My voice is pleasant to hear," and "I usually pay attention to what I do" and their disagreement to the statement "My posture makes me look awkward" may have been the outcome of positive reinforcement from the Impact management system. Average Filipinos hesitate to say good things about themselves for fear of losing social acceptance. The fact that the learners have achieved a degree of boldness to point out their good characteristics is indeed one achievement of the Impact management system.

Positive answers to the statements "I use books and materials carefully," "Rules and regulations are necessary for my school," and disagreement with the statement "I do not return books and materials to their proper places" are indicators of the Impact students' gains from self-directed activities and from the systematic ways with which the concepts have been presented in the modules.

The positive response to "I try to do my best in my lessons and assignments" and "I can usually finish my work without so much help from my teachers" speaks well of the learners' attainment of independent study habits and sense of responsibility.

The disagreement expressed by the Impact leavers to the statement "I am afraid to talk to my boss" attests to the attainment of self-confidence. Likewise, the teacher-advisers' positive assessment of the learners in the statement "moves about with ease and confidence" could be attributed to the use of positive reinforcement that has resulted in the individuals' positive self-concept.

The teacher-advisers' assessments are indicators that Impact has succeeded in its aim to help the individuals acquire self-direction, initiative, creativity, and resourcefulness through the student-directed learning modes. This finding was confirmed by employers of Impact leavers.

The teacher-advisers' positive assessment of the Impact learners in such items as "volunteers to do things for the teacher" and "is respectful and courteous to teachers" shows that the Impact learning modes have helped to retain in the learners the cherished value of social acceptance through smooth interpersonal relationships.

The diminishing number of positive answers for the second- and third-year Impact learners rings a warning bell that the affective gains from a more democratic learning environment may be lost through the years in an authoritarian learning environment.

CONCLUSIONS

The findings show that the graduates of the Impact schools are equipped with the needed knowledge, skills, and attitudes for further schooling and that they compare favourably with graduates of conven-

tional schools as shown by evaluation of their performance or achievement, self-concept, and attitude. Likewise, Impact leavers compare favourably with non-Impact leavers in achievement, self-concept, and in the nature of their postschool experiences.

Despite the limitations of this study, the findings indicate that:

- The learning modes in the Impact system have enabled learners to gain as much knowledge and as many skills and positive attitudes as are gained by those who are under the direction of professionally trained teachers;
- The Impact modules, which were prepared by classroom teachers rather than expert curriculum writers, have met the objectives of basic education as well as the professional classroom teachers have;
- The Impact learning system, which is more economic than the conventional school system, is just as efficient as the conventional system; and
- The fear of the parents about the inefficiency of programed teaching and of the modules is not supported by the achievement and the outcomes of this evaluation.

Therefore, the leaders of the Philippines educational system should consider the wider replication of Project Impact in areas where there are acute problems of lack of teachers, lack of school buildings, and inadequate supplies of textbooks and other learning materials.

The would-be implementers of Impact in the country and abroad may derive some assurance that classroom teachers, given short-term training in the preparation of self-instructional materials, can come up with modules that can deliver the objectives of education with as much efficiency as the classroom teacher who stands before the class. Furthermore, the resistance put up by parents against the innovation may be minimized if they are given empirical data to show that the components of the Impact system achieve as much as the conventional system does.

Effectiveness of Learning Modules and Peer Tutors in Student Learning

In Solo, Indonesia, Project Pamong is an Impact-type project jointly supported by the federal government and the International Development Research Centre, Canada, with the U.S. Agency for International Development (AID) also providing financial support. The purpose of the project is to develop a prototype for effective and economic delivery of mass primary education, enabling a teacher to teach at least three times the usual number of students while maintaining outcomes at least at the level reached by students in the traditional schools.

Learning materials are presented in step-by-step modules so that they can be studied by students anytime and anywhere, with minimal help from teacher, and peer tutors are trained to do, as much as possible, the work teachers usually do in helping students to learn. The use of modules and peer tutors is referred to in Project Pamong as the mediated-learning strategy.

THE MODULE

The use of learning modules in schools is based on two concepts. The first is that "the learning of any behavior, no matter how complex, rests upon the learning of a sequence of less-complex component behaviors" (Skinner 1954). Theoretically, even the most complex skills can be learned if they are dismantled into a chain of component behaviours and each link in the chain is mastered (Block 1970).

Based on this concept, the organization of the learning modules in the Impact schools reflects the scope and level of complexity of the materials and follows the principles of self-instructional methods so that students master the materials.

The second concept is that "given enough time and appropriate types of help (tutorial help), all students can conceivably attain mastery of any learning task" (Bloom 1968).

The effectiveness of modules as a mode of delivery has been investigated in a number of studies. Merwin and Schneider, for example, reported that the module was effective in increasing students' test scores on a higher cognitive level, questioning strategies among secondary schoolteacher trainees. Lloyd et al. (1969) reported that self-instructional modules were superior to more conventional methods for developing concepts and skills essential to instruction for higher

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cognitive processes. However, Hall et al. (1978) reported that listening combined with a visual aid was superior to reading as a means of learning some nursing skills. In other studies (Anderson 1976; Arlin 1973; Block 1970), programed instruction was used for students in grades 8-14 successfully. There is a possibility that modules, when designed properly, can accentuate the provision of cues, reinforcement, and feedback, and the promotion of practice.

THE PEER TUTOR

The concept of peer tutors as mediators in learning is based on the contemporary view that education is more a process of learning than a process of teaching and that effective learning is a result of productive interactions among learners. Previously, the teacher was universally regarded as central — the one person within instructional settings who can teach.

The teacher-centred educational system was founded on the belief that students are passive receivers of knowledge and teachers are givers. This traditional view of education is reflected in Locke and Hume's contention that ". . .at birth, man is essentially a 'blank slate', but as sensations are etched into the slate, he acquires knowledge of the world. . ." (Case 1973). The way in which knowledge is acquired from the "etcher" is essentially through associations: association of one set of sensations or stimuli with another.

In contrast, "Kant and Piaget assured that human beings are not blank slates which passively receive the world; rather, that they actively structure it" (Case 1973). Piaget contends that children have an innate drive to learn and actively act to fulfill their curiosity.

Questioning of the teacher-centred approach prompted various studies on the role of peer tutors as instructional agents. Most of the studies have found that under the guidance of teachers, peer tutors can be effective (Sarapee 1979; Klosterman 1970; Shaver and Nuhn 1968). Some other studies have reported that tutoring is beneficial not only for the tutees but for the tutors as well (Sarapee 1979). With guidance from professional teachers, peer tutors are capable of providing cues, reinforcement, and feedback for the tutees and systematically promoting practices.

In Project Pamong, the conceptual framework is put into operation through working manuals for teachers and peer tutors; these specify the jobs to be conducted in the self-instructional programs. The job descriptions are the basis for the mediated-learning strategy, which has been used in the Solo Pamong schools for a couple of years.

In the Pamong project, one major research question has been whether peer tutors and modules are effective mediators in a learning strategy. To answer this question, educators set up a microlevel experiment in Waru I, Waru II, Kebak II, and Kebak III primary schools in November 1980, incorporating a total 151 grade 6 students. Waru I and II schools acted as controls, using a nonmediated, traditional learning strategy; in Kebak II a module was used in the learning strategy; and in Kebak III peer tutors and a module were used. This experiment

provided a means of judging the effectiveness of modules and peer tutors as mediators in the learning strategy. The variables that were controlled were location of the schools, students' socioeconomic background, and school characteristics, such as the teachers' educational background and working experience.

PROCEDURES

The microlevel experiment lasted 3 days; on each day a more complex concept was introduced. Students' scores on tests in the subject matter (multiplication and division), the time it took them to learn (in minutes), and their need for remediation associated with each learning task were the criteria for comparison. These were used in calculations of the students' index of learning effectiveness (ILE).

The teachers in Waru I and II presented material, administered tests; corrected students' work sheets; provided remediation for those who did not attain 90% on the tests; and repeated the process.

The procedures in Kebak II were the same except that the material was not presented by the teachers; rather the students individually studied the material in a learning module. Remediation was undertaken by the teacher. In Kebak III, the procedure was the same as in Kebak II, except that correcting students' work sheets and remediation were conducted by peer tutors.

Data collected were the students' time for original learning or the time needed to present the material; students' test scores; their remediation times; and frequency of remediation.

THE EFFECTIVENESS MEASURE

The ILE, developed in this study, assumes that effectiveness can be measured in the amount of time and frequency of remediation required by students to attain a satisfactory score or a set of sequential scores. The development of this measure was to overcome the shortcomings of the use of test scores and learning times as separate measures of effectiveness. For example, in Waru I one student attained a score of 90 on the first test; his time to learn was 45 minutes, no remediation. A second student attained a score of 100, but his time to learn was 73 minutes with two remediations. Using the two students' scores as the sole measure of learning effectiveness indicates that the second student more effectively learned the material. The use of time to learn alone as a measure neglects frequency of remediation. In Waru I, for instance, one student required 58 minutes to attain the score of 90, with one remediation. Whereas another student required 58 minutes to attain the score of 90 with two remediations. Even though they took the same amount of time, the two were not equal in effectiveness.

The mathematical formula to compute each student's ILE was

$$\sum_{i=1}^{r+1} (X_i e - \lambda_i)/r + 1$$

where X_i = the average of his or her test scores; e = Napier's number, exponential function; λ_i = the total time a student needed to achieve original learning minus 20 minutes, the shortest time possible for effective learning of the task; and r = frequency of remediation ranging from zero to two. The empirical data obtained through the experiment were the basis for the constant.

The peer tutors and modules were to be considered effective mediators if the students' ILEs in Kebak II and III were not markedly lower than students' ILEs in Waru I and II. This approach assumes that traditional methods of teaching-learning (in Waru I and II) reflect standard effectiveness as reported in a large number of studies (Anderson 1976; Block 1971; Burrows and Okey 1975; Glasnapp et al. 1975).

RESULTS

The data indicated that the module was an effective mediator during preremediation (or initial) learning. The preremediation ILE (PRILE) was computed on the basis of a student's preremediation score (PRS) and preremediation time to learn (PRT), with frequency of remediation (FR) being zero. The difference in PRILE from students at Waru I/II and Kebak II is regarded as attributable to use of the module. The PRS, PRT, and PRILE in Waru I/II were 62.88, 41.17 minutes, and 50.7 respectively, whereas in Kebak II they were 70.43, 46.15 minutes, and 54.03. Although the students using the module took longer to learn, their preremediation score was 7.55 points higher than students under the traditional method.

Peer tutors were effective in remediation but not during the preremediation teaching-learning stage. The students' (average) PRS, PRT, and PRILE in Kebak II 70.43, 46.15 minutes, and 54.03 compared with 56.02, 34.72 minutes, and 47.24 in Kebak III. The difference of PRILE between Kebak II and Kebak III could be thought of as attributable to the peer tutors. Thus, the use of peer tutors in Kebak III made it possible for the students to complete preremediation in a shorter time than Kebak II students but with an average score on the initial test that was 14.41 points lower.

This finding indicates that peer tutors are not capable of helping others to learn information that they are, themselves, just learning. In this study, the peer tutors were unfamiliar with the subject matter, but in some self-instructional programs they would be versed in the material before attempting to provide assistance. Thus, although the peer tutors in this study were ineffective in providing information during the original learning process, they may in fact be quite effective under circumstances where they are familiar with the concepts. This experiment was conducted at the end of the July-October trimester, and it used the learning tasks to be studied at the beginning of the November-March trimester. No student had studied the module that was used in the experiment, even though in the Impact experimental schools student learning was self-paced. In this situation, while the teacher was available to help (and in some cases he did help on request), most students felt more comfortable seeking help from their (peer) tutors.

Table 1. Overall effectiveness of the module and peer tutors as mediators of learning.

School	Mean FS	Mean FT	Mean FR	Mean ILE
Waru I/II	89.75	48.84	0.88	59.28
Kebak II	89.45	53.20	1.10	59.70
Kebak III	89.03	46.74	1.39	58.27

The peer tutors were effective in giving remedial help as measured by their ability to pull up students' test scores, to shorten the time involved, to cut down the frequency of remediation, and to increase students' ILE. Thus, the peer tutors in Kebak III accounted for final scores as much as 13.99 points higher than in Kebak II, remediation as much as 4.97 minutes longer and 0.29 times more frequent, and a final ILE as much as 5.36 points higher.

Considering that ILE is the most dependable measure of learning effectiveness (because it considers test scores — preremediation score (PRS) as well as final score (FS) — frequency and time of remediation simultaneously), the findings indicated that the peer tutors were effective in providing remedial help in the self-teaching programs.

It is noteworthy that, after a student attained a score of 90% on the test, he or she did not take the test again or undertake remediation. Rather, the same test score was used in calculation of averages for subsequent tests. As the students who attained the criterion level early were never remediated, the inclusion of their scores in average scores did not affect the analysis of remedial power. However, it did affect the analysis of average scores.

The data confirmed that modules and peer tutors were effective mediators of learning when students' ILE was used as a measure of learning effectiveness (Table 1).

Even though the differences in time and frequency of remediation were statistically significant at 95% and 99% confidence levels, the differences in final scores and ILE were not significant. Considering that ILE is the most dependable measure of learning effectiveness, one may assume that the use of a module in Kebak II and peer tutors in Kebak III did not give students a lower index of learning effectiveness than did the traditional approach in Waru I and II.

Response to Increasing Difficulty in Subject Matter

One question that has not been answered is how effective was the mediated-learning strategy in responding to increasingly difficult learning materials in the 3 consecutive days of experiment. One way to answer this question is to measure the rates of change of the parameters of effectiveness during the 3 consecutive days.

The students' PRS, PRT, and FR in day 1 can be thought of as the result of the original (preremediation) teaching-learning process in day 1, whereas each subsequent score reflects the learning that takes place between tests — the sum of any remediation given and teaching-learning of new concepts. For example, the rates of change of PRS, PRT, and FR between days 1 and 2 can be attributed to the effectiveness

Table 2. The rates of change of PRS, PRT, FR, FS, and ILE from day 1 to day 2 (in %).

School	PRS	PRT	FR	FS	ILE
Waru I/II	34.75	5.88	-37.69	0.69	18.61
Kebak II	32.98	-29.98	-54.32	-0.39	6.18
Kebak III	38.47	15.14	-18.42	0.73	19.27

of the remediation based on day 1 and the original teaching-learning in day 2.

The students' FS and ILE in day 1 can be thought of as the result of the original teaching-learning process and remediation in day 1. Subsequent scores are the sum of all teaching-learning of new concepts and remediation up to that time. Thus, the rates of change of FS and ILE between days 1 and 2 can be attributed to the effectiveness of the teaching-learning of new material in day 2 as well as the remediation in day 2 (Table 2 and 3).

The conclusions that can be derived from the results are that:

- In Waru I and II, teaching-learning and remediation in days 2 and 3 combined were more effective than in days 1 and 2 combined in shortening students' FT and in cutting down students' FR, under conditions of increasing difficulty in the learning materials.
- In Kebak II, teaching-learning and remediation in days 2 and 3 combined were less effective than in days 1 and 2 combined in all measures, under conditions of increasing difficulty in the learning materials.
- In Kebak III, teaching-learning and remediation in days 2 and 3 combined were more effective than in days 1 and 2 combined in increasing students' PRS and FS, in shortening students' FT, and in cutting down students' FR.
- And in all schools, teaching-learning and remediation in days 2 and 3 were less effective than in days 1 and 2 combined in increasing students' ILE under conditions of increasing difficulty of learning materials.

Therefore, the mediated-learning strategy as represented in Kebak III is most effective in responding to the increasing difficulty in learning materials.

The effectiveness of the mediated strategy in responding to the increasing difficulty largely depends on the effectiveness of the mediators in the preremediation (original) and postremediation teaching-learning processes. Whereas, in this study, peer tutors were effective mediators in the postremediation teaching-learning process, they were

Table 3. The rates of change of PRS, PRT, FR, FS, and ILE from day 2 to day 3 (in %).

School	PRS	PRT	FR	FS	ILE
Waru I/II	13.13	- 2.50	-38.27	0.07	6.48
Kebak II	32.98	-22.33	31.08	-0.86	-15.46
Kebak III	38.47	-17.11	-54.19	1.27	13.74

not effective in the preremediation teaching-learning process. Although the module made it possible for Kebak II students to start with high PRS and PRILE, the intervention of the teacher in remediation was not effective enough to make the students end up with the highest FS and (F)ILE in the shortest FT and fewest FR possible. Conversely, while the preremediation teaching-learning did not allow the students in Kebak III to start with high PRS and PRILE, the remediation (by peer tutors) was effective enough to make them end up with FS and (F)ILE that were not too far apart from those in Kebak II and Waru I and II. Further improvements of peer tutors' skills to remediate may improve the effectiveness of the mediated strategy in responding to increasing difficulty, even when measured in terms of ILE.

Theoretical and Operational Implications

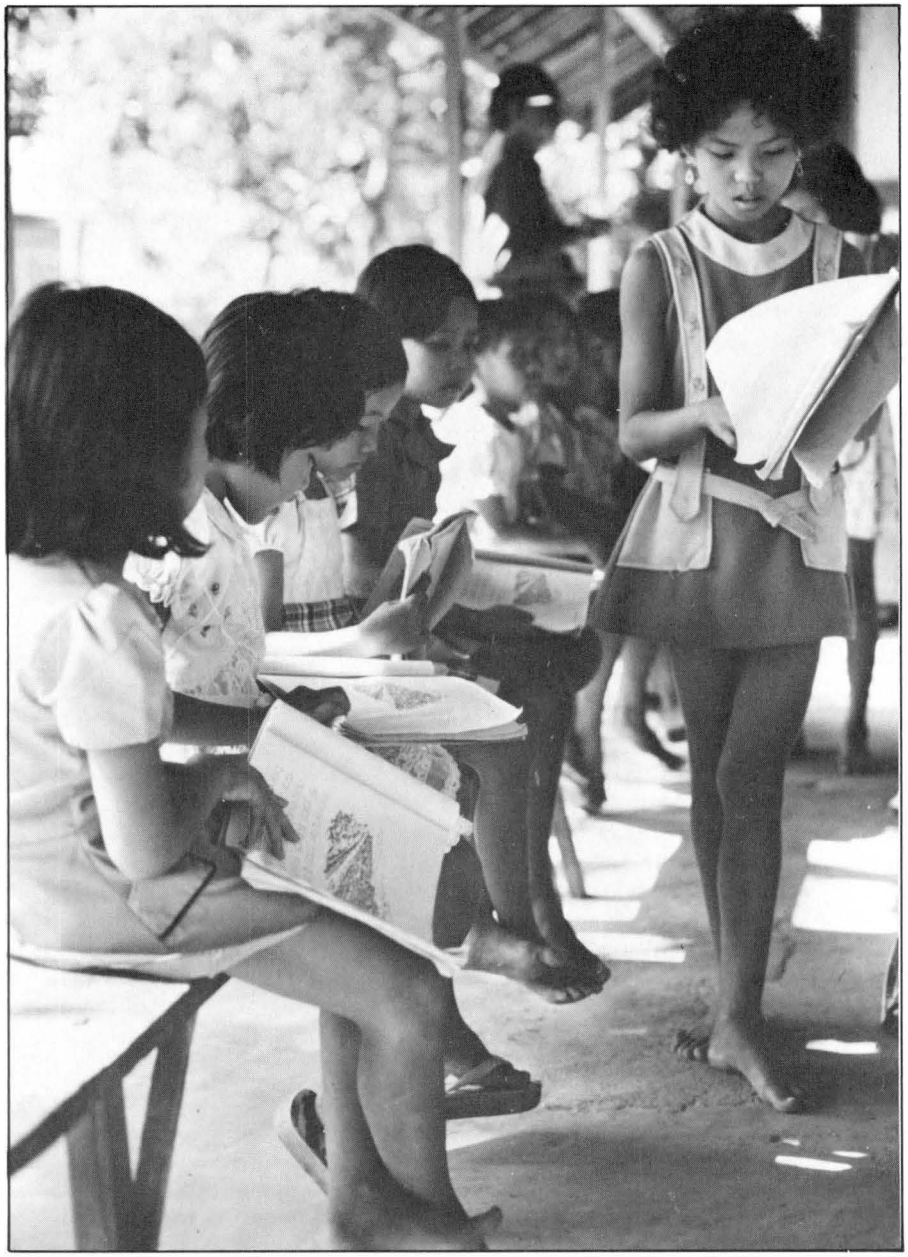
The effectiveness of the mediated mastery learning strategy as represented by Kebak III suggests that the shift from the concept of education as a process of teaching to a process of learning is feasible. In addition, the findings in this study also imply that mastery learning can be accomplished in ways other than the traditional teacher-centred approach.

Properly trained, peer tutors and well-designed modules can do much of the work teachers usually do to implement mastery learning. Because the work for managing learning is assisted by the mediators (the peer tutors and the modules) and, in a sense, by the students themselves who are functioning as active learners, the teacher has more time to manage other aspects of learning. He or she can supervise education and administration, encourage students' learning motivation, etc. — tasks that "...are believed by many scholars to affect school learning..." (Bloom 1976). The shift of the primary task of teacher from managing learning to managing learners was a shift from what had been considered the "central issue" to the "peripheral issue" of learning. My feeling is that the "peripheral issues" of the traditional school learning are not peripheral and can receive prominence in self-instructional programs.

Shulman (1976) pointed out that the traditional mastery learning approach relies primarily on "human beings (teachers and students) for its success rather than on. . .technological devices. . . ." This study indicates that self-instructional programs rely for their success more heavily on students, peer tutors, and modules, than on teachers.

It is evident that reliance on educational technology (modules and self-instructional materials) is one of the important characteristics of the mediated-learning strategies. This study suggests that such materials do not endanger students' learning achievement.

Cloward (1967) and Gartner (1971) reported that the peer tutors profited from the socialization provided by the experience: the students' academic motivation, sense of responsibility, and the feeling of being useful and needed all improved. For the "bright" students, to be tutor means to have an opportunity to accelerate their process of socializa-



Peer tutors in Project Pamong are compensated for their efforts through greater self-reliance and confidence as well as increased opportunities for cooperation.

tion. For the "less bright" students, to be tutor means to have an opportunity to "eliminate" the barriers of socialization they normally encounter. An ancient dictum *Qui docet discit* (or, the one who teaches, learns) is quite true for students who assume the role as tutor. They learn more, and they have to learn more because the role of tutor demands it.

As reported in a number of mastery learning studies, mastery strategies require greater student study time than nonmastery strategies (Block 1972; Jones 1974; Wentling 1973). One of the sources of the additional time for applying a mastery learning strategy has been the teachers themselves. To "pay" the cost, teachers have been prompted to prepare and organize their mastery instructional plans, procedures, and materials outside the class and before the instruction begins, or outside their working time at home.

Because peer tutors are trained to help teachers in managing the learning, the teachers have more time during school to manage the learners and aspects of the management of learning that the peer tutors are not able to do. In other words, the use of peer tutors makes it possible for teachers to "pay" the cost of additional time for applying mastery learning without bringing extra work home. In most developing countries, where teachers cannot live on their salary, they need to do extra work at home (like farming) to have some additional income for their family.

The mediated-learning strategy offers flexibility in terms of time and place of learning, most particularly to primary school dropouts who have decided to return to school. The flexibility is signified by the freedom for the students to take the module from the learning posts, to study it elsewhere, and to take tests whenever they like. This flexibility means that the Impact strategy potentially offers multiple entries and exits for students who, for one reason or another, are not capable of coming regularly to school.

Mediated mastery learning makes it possible for a teacher to manage at least 70 learners so this learning system is potentially economic. At present, 80–90% of educational costs are those associated with teachers' salaries (Coombs and Hallak 1972). The higher teacher: student ratios in the mediated-learning strategy could lower teacher costs per student and, thus, lower educational costs per student. Roughly 60–70% of the costs for producing modules at the experimental stage are those associated with development, such as module writers' salaries and training, and small-scale operations. The high developmental costs, on the one hand, and the small production for experimental purposes, on the other, account for the high module costs per student. Developmental costs per student should be reduced when modules have been standardized and are produced on a massive scale.

The peer tutors are unpaid. This strategy is based on consideration that tutors who anticipate an external reward, such as money, will perform less effectively than those who do not expect any reward. This is confirmed by some studies such as one conducted by Garbarino (1975). The functioning of peer tutors, which makes it possible for a teacher to manage a larger number of learners, indirectly lowers the educational costs per student.

Limitations and Implications of the Study

What is the current status of the Impact experiment? What are the contributions of the findings in this study?

The limitations of the findings in this study were that:

- The experimental time was probably too short to produce a convincing picture about the effectiveness of modules and peer tutors as mediators of the Impact strategy, when Waru I and II were used as control schools.
- In their day-to-day operations, Waru I and II were traditional schools. The teachers in the schools had only a day training on mastery learning before they participated in this experiment.
- The other four main subjects (natural sciences, social sciences, civics, and Indonesian language) were not presented in the micro-level experiment. Peer tutor and module effectiveness in one subject may not represent the effectiveness in other subjects.
- Self-teaching programs are being implemented in Indonesia in grades 1–6. The microlevel experiment only dealt with grade 6 students. Peer tutors and modules may be effective for children in grade 6 but not for other grades.
- Although the students in self-teaching programs include out-of-school students (primary school dropouts who come back to school), the present study was only concerned with regular, in-school students. The effectiveness reported here may not hold for the out-of-school students.
- There are many aspects other than teaching–learning that were not covered in the study, such as community participation, management information systems, monitoring and evaluation, etc. An effective teaching–learning does not necessarily mean that other aspects of the Impact primary school system are effective.

Within the limits of these constraints, the present study confirmed the effectiveness of peer tutors and modules as mediators of learning.

The Current Status of the Impact Experiment

The prototype model for Impact, which the Solo project is seeking to develop, consists of three main elements: the module, the personnel manuals, and the actual operation of the self-instructional school system, which is (potentially) massive, effective, and economic. The findings of this study show that the Impact module, despite its imperfections, is sufficiently effective to aid students in attaining a high average of pre-remediation (original) learning with minimal help from teacher or peer tutor. Monitoring for further module improvement is being done. A separate study is now being done by the Solo Impact microstudy team to ascertain the extent to which the Solo Impact manuals are actually being implemented by field personnel in Solo as well as in Gianyar, Bali, under conditions of normal (routine) supervision.

All these activities are to ensure that an Impact primary school model will be developed in due time. An effort is even under way to identify places in Indonesia where the model can be implemented for educational development purposes. There is a strong possibility that the self-instructional primary school model will be integrated with other primary education models as a basis for an integrated universal primary school program in Indonesia. The plan for integrating the models is

being prepared and will be communicated to educational personnel in Gianyar, Bali, for immediate implementation.

This study shows that preremediation learning and postremediation learning are both important for students to attain a higher index of learning effectiveness. In the mediated-learning strategy, the module has an important role in helping students attain high preremediation scores and preremediation ILE. To improve the effectiveness of the module in postremediation learning or to improve the role of module as remediator, one may:

- Make the module being studied available for students during the remediation process. If the module were available to the students, they could reread it and study it during the remediation process.
- Make other modules that are relevant to the learning materials being studied available during the remediation process. This is necessary because a problem is often rooted in a poor understanding of concepts presented in earlier learning materials.

The effectiveness of peer tutors in preremediation learning may be improved by means of intensifying of the teacher's supervision.

Questions for Further Studies

Many questions about Impact still need to be answered, and some could be addressed by microlevel experiments. For example:

- Is the Impact-mediated mastery learning strategy effective under conditions of high (1:70 or more) teacher:student ratios?
- Is the Impact-mediated mastery learning strategy economic in terms of teacher:student ratios, developmental and operational costs associated with module production, training costs, and backup research?
- How much different is the work load of teachers who implement the mediated strategy from that of those who implement the nonmediated mastery learning strategy and from that of those who implement the nonmastery learning strategy?
- How do teachers pay the extra time-cost that is needed to implement the mastery learning strategy?
- How do dropouts pay the time-cost or the extra time-cost to learn under the mediated-learning strategy, a strategy that claims to offer a multiple entry and exit system to them?
- How could the self-instructional primary school model be integrated with other existing primary education models within a universal primary school program?

A student in Project Impact: what are appropriate ways to measure the project's influences on her and to ensure that positive changes are not lost later?

Dissemination and Utilization of Education Research: the Impact-type Projects

The informal chain of Impact-type projects linking several developing countries illustrates educational research dissemination and utilization. The phrase "dissemination and utilization" is used broadly in this paper to refer to the processes that operated in the national and cross-national promotion and adaptation of ideas and products related to this particular educational innovation. This paper highlights some examples of these processes to show how they contributed to the acceptance and spread of the innovation and its technology. These examples illustrate features of at least three models in research dissemination and utilization — problem solving; social interaction; and research, development, and diffusion.

Relating examples with models is an indirect way of suggesting some approaches to research on dissemination and utilization such as case studies or the application of one or a combination of standard models that look more deeply into events and interactions in the transfer and adaptation of ideas, experiences, and products.

Outsiders and Insiders in Problem-Solving

In the case study I did on the Philippine Impact Project (Flores 1981) I found that outsiders (consultants and donor representatives) played a pronounced role, especially during the stages of project identification and research design development. This role, which was primarily one of consultation and collaboration rather than decision-making was also apparent in the other original pilot site in Indonesia.

Searching for solutions or alternatives to the problems of cost and quality of primary education, Southeast Asian and Western educators met several times, in the early 1970s, and discussed the feasibility of adapting a range of educational concepts and technology that were popular at that time. For example, ideas characteristic of deschooling, community schools, nonformal education, and modular technology were presented and debated during the meetings. The conveyors of these educational innovations were mostly Western educators connected in one way or another with international funding agencies. Although these outsiders continued to participate in several stages of project develop-

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ment, their role in decision-making did not largely determine the direction of the project. The client-users (Filipinos and Indonesians) were active in the discussions, and they made most of the decisions about the choice of experimental sites, administrative structure and arrangements, development and implementation of self-instructional and programed teaching technology.

The events and decisions before field experimentation corresponded to features of a problem-solving model of research dissemination and utilization. Basically, this model is seen as a "patterned sequence of activities beginning with a *need*. . ., translated into a *problem* statement and *diagnosis*" (Havelock 1971:86-87). From this, the process moves to a search and retrieval of ideas and information resulting in the selection and adaptation of an innovation. An outsider role is recognized as important in this model, but, for the innovation to succeed, that role should be consultative or collaborative. Furthermore, full use of existing internal resources is also recognized as important in the success of problem-solving (Havelock 1971).

Consultation and collaboration in problem-solving may be validly extended to the dissemination of the Impact/Pamong innovation in other developing countries. In a real sense, the exposure through visits to field sites in the Philippines and Indonesia of educators from Malaysia, Liberia, and Jamaica was dissemination. Although these observation visits were financed by donor agencies (one example of donor roles in dissemination), the decisions to embark on similar experiments and to adapt the technology had been taken mainly by the people in these so-called Third World countries. Moreover, the freedom for local educators to plan their project, design the research, and develop the technology (e.g., modules, programed teaching, peer group and self-teaching methods) challenged their innovative talents. The result was rich, flexible variations in methods and technology of teaching and learning.

Another dimension of consultation and collaboration in research dissemination may be seen in the sharing of expertise and products from the original sites to other countries. Short-term consultants, for example, were requested by the Malaysians to train module writers for Project Inspire. Progress reports and sample modules were sent to Jamaica, and periodic meetings were held between the Philippine and Indonesian research teams to exchange information and share experiences. All these were valuable activities that not only contributed to the positive progress of the experiment but also enhanced the research skills of native educators.

Social Interaction Model

Many events in the planning, implementation, and replication of the Impact-type technology, both nationally and cross-nationally, reflect the characteristics of the social interaction model in research dissemination and utilization. According to this model, five principles characterize successful diffusion of innovation. These are that the adopter belongs to a network of social relations that largely influences her or his adoption behaviour; that her or his place of centrality, peripherality,

or isolation in the network determines her or his behaviour in accepting new ideas; that informal personal contact vitally influences adoption; that group membership and reference group identifications are major factors in adoption behaviour; and that diffusion begins slowly but accelerates to a rapid rate (Havelock 1971).

In the Philippine, Indonesian, Malaysian, and Jamaican projects, one key to the relatively easy country acceptance of the innovation was that important decision-makers in the education ministries were brought into the project management structure. For example, the Philippine Deputy Minister Albarracin was the country's representative to the governing board of the project-administering agency, Innotech, and Regional Director Tiro (in whose region Impact Naga belongs) was an Innotech fellow at the time. The inclusion in the national steering committee of Elementary Education Director Soriano and Philippine Nornul College President Sibayan helped secure easy acceptance at the start of the experiment. In Indonesia, the influential Pusponegoro was Secretary-General of SEAMES (Southeast Asian Ministers of Education Secretariat) at the time. There was also a direct link between Innotech and BP3K (the research and development arm of the education ministry — Badan Penelitian dan Pengembangan Pendidikan dan Kebudayaan) through a special Innotech unit in BP3K itself.

The importance of the network of social relations is also shown in the solving of critical problems during implementation. The first one of many examples in Impact was an absentee instructional methods expert in the Philippine project.

The continuity of the network of social relations in innovation acceptance is further illustrated in the Jamaica project. The events leading to the initial decision to start the experiment in Jamaica began with the visit to the Philippine sites of a powerful group, including among others the Minister of Education himself and the president of the national teachers' union. While this group remained in their positions, the planning of the experiment went smoothly. Unfortunately, before firm decisions were completed to implement the project, a change in education minister occurred. A somewhat different network of social relations resulting from the change meant some delay in moving the project to implementation.

The Malaysian Project Inspire, unlike the Philippine, Indonesian, and Jamaican experiments, is based in a provincial state university. But the direct participation of key officials from various levels of the Ministry of Education was ensured even during the project development discussions and has been maintained throughout. In fact, in the Malaysian case, this network of social relations has recently influenced several significant developments — for example, an eagerness on the part of the Ministry's Curriculum Development Centre to use the Inspire technology in implementing (starting in 1983) of the "back to the basics" national policy for primary education. Another encouraging development is the adoption of the Inspire programed teaching guides in Sabah and the recent substantial financial appropriation of the government to pursue further the experiment.

The Philippine and Indonesian projects provide additional examples of success in channeling research results or products into the system

through social interactions. In the Philippine case, an important research and development unit of the education ministry, EDPITAF, was isolated during the entire 5 years of experimentation. This fact played a significant part in preventing the Impact technology from entering the wider system despite evidence of its being more economical and effective pedagogically than was the conventional system. However, through a combination of informal personal contacts, wide publicity, and Impact's timely appearance (e.g., the need for a viable alternative delivery system to implement a national decentralization policy), EDPITAF came forward and took active interest in the expanded tryout of Impact. EDPITAF now sees Impact's potential to interlock with the various components of the primary education system.

In Indonesia, the explicit appearance of Pamong in the current 5-year development plan provides another example of the importance of social relationships. Aside from the merits of the technology itself, the decision to include Pamong in the plan was largely due to the harmonious relationships between key officials with BP3K (e.g., the BP3K director and the head of the unit responsible for the Pamong experiment) and between BP3K's director and other ministry officials including the minister at that time. Seeing the possible role for Pamong in stemming Indonesia's high dropout rate and in improving access to primary education, two international donor agencies responded with support for the experiment's expansion to two islands outside Java.

Research, Development, and Diffusion Model

Although a research, development, and diffusion model is generally applied in space and defence industries and in agriculture, some of its components seem to be operational in the dissemination and utilization of the Impact-type technology. The sequence includes research, development, and packaging before mass dissemination; planning for large-scale implementation over a long time; division and coordination of labour to go with planning; rational acceptance or adoption by the consumer; and willingness among the proponents to accept high initial development costs on the expectation of long-term benefits in efficiency and quality and for mass dissemination (Havelock 1971).

Several countries involved in introducing the Impact-type technology are showing promise as contributors to the research, development, and diffusion model. One that is closest to this model is the IEL project of Liberia. IEL has been committed since the very beginning to developing a system that can be packaged for national implementation.

Although the motivation behind it was different from IEL, Indonesia's Pamong may be said to possess the potential also to develop into a model. Indications of this possibility include: the inclusion of Pamong as a policy option in the 5-year development plan; the planning of a national survey to determine geographic areas where Pamong fits; further development, refinement, and research about the efficiency of the Pamong technology; and tryouts of Pamong in a variety of intracultural settings (e.g., Bali) and school situations (e.g., small schools in Kalimantan).

Impact Philippines is now officially incorporated in the PRODED (program for decentralized educational development) scheme and with financial support from the World Bank, further adaptation, refinement, and expansion of the technology could move Impact further into a model of dissemination.

It may be too early to tell in the case of the Malaysian Inspire, but this, too, may be rapidly transformed into national-scale dissemination. This possibility, of course, assumes that Inspire's technology can demonstrate its efficacy in terms of superior pupil learning performance.

DISCUSSION

Various links have operated in the dissemination and utilization of the ideas, methods, and products of the Impact-type innovation and technology. Although I have emphasized the relationships between events in the various country projects and features of existing models in research dissemination and utilization, other factors should not be overlooked or naively taken for granted. Success of educational experiments involving human beings cannot be easily attributed to the application of standard models. Somehow, there will always be extraneous human or nonhuman factors that can affect success or failure. Research on dissemination strategies — whether they are case studies or applications of known models — will be confronted with the complexity of human behaviour.

The initial success of the Philippine and Indonesian projects and the encouraging progress of the younger ones in Malaysia, Jamaica, and Liberia indicate the important role of dissemination and utilization in the early as well as in the final stages of the educational research and innovation. There will always be advocates for more research about education, especially in developing countries. And there will probably be donors, local and foreign, who will respond sympathetically to these researchers or their institutions, more so when proposals are argued in the name of "development." The cry of development-relevant educational research may overshadow the equally important concern of what happens after the research is done and the report printed. Until dissemination and utilization of research results and products are attended to seriously, much valuable research will remain unassembled parts or pieces that are bound to gather dust and rust.

Research and Evaluation in the Project Development Process

The papers in this volume make clear the variety and complexity of self-instructional learning projects. Casual views of different project classrooms reinforce this picture. The programed teacher (or older pupil) teaching rote reading lessons to younger pupils under a thatched roof in Sapang Palay in the Philippines little resembles the individual pupil working through a lengthy series of modules, work sheets, and games in a self-contained French-language class in Quebec. But all the projects share a delicate balance and frequent tension between the development of the project (module writing, teacher training, test construction) and the research and evaluation needed to improve it, understand it, and ultimately justify it. "Research" and "evaluation" are closely related activities. The former implies questioning how and why an innovative project works; the latter assesses to what extent the project is actually being implemented and examines what kind of changes, if any, it has produced. The term research is often used here to include both kinds of activities. Too much focus on project development leaves little information on what works and why; as Kenneth King writes in the introduction, such a focus is "inimical to research and reflection." But too much concern for research can leave the project itself uncompleted and — worse yet — unattractive to donors and policymakers who need to see results and upon whom future dissemination rests.

The tension between research and development activities as described in this book is a problem of efficiency more than of political persuasion or theoretical perspective. It is a tension that results when governments wish to institute reforms rapidly and inexpensively, and funding agencies wish to see quick returns on their investments so that research and comprehensive evaluation activities are often neglected.

There are several reasons that such neglect is unfortunate — why a healthy dose of research and evaluation is necessary in development projects of this type. First, some research is needed to demonstrate to the decision-maker and donor that the project works and is worth continuing.

Research is also needed for improvements or refinements that make the project more efficient and less expensive, more popular with and relevant to target populations; to uncover information on project processes and outcomes (e.g., noncognitive) that, in the long run, may be

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more compelling reasons for continued project development and dissemination than are simple changes in cost and achievement; and to provide data and insights that can help personnel in similar projects elsewhere and that can shed light on more theoretical, even academic, issues related (in this case) to self-teaching processes.

The attempt to fulfill these tasks in the midst of writing modules and correcting achievement tests leads to tension. Some relief from the tension is possible if a design for research and evaluation strategies is incorporated in the project from its very beginning, if it is prepared before the project starts, if data are gathered from the first day of development or sooner, if flexibility in altering the design — expanding it, tightening it, redirecting it — is built into the development process, and if one or more project staff are assigned full time to research. The major focus of this chapter is on the kinds of issues that should be considered in the construction of a design for comprehensive research and design activities. The crucial question is what kinds of data should be gathered at which stages of the development process by what kinds of research and evaluation. What aspects of the project, in other words, should be examined and explained during its entirety, throughout planning, implementation, and dissemination, and how should this examination be done?

Design Issues in Development Project Research

The answer to this question addresses:

- The kinds of information needed about the project's context, assumptions, and goals;
- The kinds of data needed on resulting changes and on how these changes occurred; and
- The research strategies and methods required in an assessment of the projects and an understanding of how they work.

Data on Project Contexts, Assumptions, and Goals

An accurate description and assessment of any self-instructional project cannot be made without a clear understanding of the setting in which it began, the assumptions about teaching and learning upon which it is based, and the rationales for its particular goals. Such information is needed to put any analysis of the project's development and ultimate impact upon firm contextual, historical, and theoretical ground; change is better understood if one knows where it came from. Any design for research and evaluation should, therefore, include ways to obtain such data — the earlier, the better.

Though considerable information is available on how each of the self-instructional programs described in this book was initiated and developed — records of ministerial meetings, proceedings of planning sessions, and stories of battles with various bureaucracies — there is much less information on project contexts, assumptions, and rationales. Yet there are important differences that affect how each project began and has developed. The educational context of Liberia, for example, is very different from that of Malaysia. In Liberia, fewer than 50% of its

primary school age children are in school and only 30% of its teachers are trained, compared with almost 100% in both categories for Malaysia. Likewise, the cultural context of the Philippines is very different from that of Quebec; family harmony and peer cooperation are stronger values in the former than in the latter. Such differences — educational, cultural, social, economic, bureaucratic — are important determinants of project genesis, development, and ultimate success or failure and, therefore, should be carefully described.

Similarly, each project is influenced by rather different — but usually unspoken — assumptions about the importance of education; the appropriate roles of pupil, teacher, and parent; and the ability of teachers. Malaysia looks to a national examination at grades 5 and 9 as the major criterion of success for the education system; in Liberia, the school is presumed successful if it leads to basic literacy. Parents are assumed to be an integral part of Primer and Impact but are ignored in Inspire; pupils are expected only to learn in Malaysia but to be able to teach in the Philippines and work closely with peers in Indonesia. And whereas the modules are seen as a teacher-proof curriculum in rural Malaysia, where poor teaching is assumed to be a major cause of school failure, they are seen in Quebec as means by which teachers can be liberated from mechanical tasks and can spend more time in creative service and supervision. Again, these assumptions should be fully described as important data against which a project's development and future success can be analyzed.

Finally, related to these assumptions are the rationales for explicit and implicit project goals — to produce autonomous, responsible pupils, as in Quebec, or to develop systematic, organized learners in Indonesia. Why were these goals selected and not others? Who made them and how have they been altered in the course of project development? A description of these rationales from a historical and contextual perspective is an important part of any final assessment of these self-instructional programs and of individual project achievements.

Data on What Has Changed — and Why

If the contexts, assumptions, and goals of each project are systematically described, it should be easier to understand what has been achieved and how it was achieved. The success or failure of explicit goals as well as the appearance of unanticipated consequences should also be more easily explained. The analysis of changes resulting from the project, however, requires much more data — of many different kinds gathered throughout a project. It is not enough for the harried project developer to depend on achievement test results. If these prove inconclusive, what other outcomes can be used to rationalize further project development? The collection of data that indicate success or failure in reaching other desired outcomes must be planned in the original design for research and evaluation. A design for measuring change should include three levels of analysis.

At the level of the education system, one can examine whether and how these projects influence or require changes in texts and other teaching materials (whether the modules replace or complement texts), teacher training (if 2 weeks are really enough to train an IEL teacher

in Liberia, what happens to colleges of teacher training), teacher supervision, and system-wide enrollment, absenteeism, and dropout rates. At this level, one can also analyze costs. Are these innovations cheaper to begin, maintain, and renew than the systems they replace? Finally, do the changes brought about by these projects make it more or less easy to integrate them into the traditional system?

At the school and classroom level, other criteria of change can be assessed. Can the principal handle the new role of being a manager of managers? Can adequate records be kept and student evaluations be based on the new procedures and new tests? Are the modules available to the students or locked away with the textbooks? Most critical, perhaps, is whether there really is a new structure to the class and a new climate in the classroom. Do children really work alone or in groups, with adequate order and organization; and do the teacher and the aide really manage, guide, correct, and remediate or — like so many other innovations — has this one also been overwhelmed and subsumed by traditional classroom structure and environment?

Finally, at the level of the individual, the most complex criteria of change must be examined — in academic skills, cognitive growth, affect, and behaviour. Have students learned? Are they more cooperative, independent, motivated, and honest? Do they have improved self-esteem? Are they better citizens and leaders? Are they happy? Are teachers less bored, more enthusiastic, more concerned with individuals — and are *they* happy? And are parents and the surrounding community more active in educational affairs or at least more supportive of the schools? Are they satisfied with the system? This last question is an important measure of success in many politically volatile developing nations.

The possibility of differences in impact of self-teaching systems on children and teachers of different aptitude, character, and background is critical. It may be enough to demonstrate that the use of modules generally raises grade averages (or at least maintains them) but it may be more important to show that they work best for the weakest (or strongest) student, the least-skilled (or most competent) teacher. The importance of this kind of information should be recognized in the design of research for such developmental projects.

Although difficult, it is not enough to measure change in systems, classrooms, and individuals resulting from new educational projects. Researchers must also be able to explain how such change occurs, why a project succeeds or fails. Is it the content or the structure of modules? The climate or the organization of the classroom? The work of teachers or peers? Or simply the presence of new materials, new technologies, and a horde of researchers? In other words, how do the crucial processes and interactions of the system work? What happens during self-teaching? How does a pupil interact with a module? How much time is really spent on academic tasks? And what is the nature of peer-tutoring: who gains most from it and how?

Given different questions, different audiences for answers, and different stages of the development process, one needs very different approaches to research and evaluation. Just as multiple kinds of data are required to analyze multiple outcomes of projects as well as success

or failure, so, too, are multiple methods and measures required to gather the data. An examination of contexts, assumptions, and goals, for example, requires reflective, descriptive analysis. This is best done at the time the project is being developed through extensive notes on early discussions and decisions — about which components of the system to use or adapt, what sample of schools to select, which actors in the school setting to assign to which roles, and what to choose as the primary criterion for success. If such data are not collected as events occur, a more retrospective analysis can be done later through interviews and archival research. The result should be rich in historical, contextual, even philosophical detail.

As opposed to this kind of analysis, the measurement of change resulting from development projects and the analysis of how such change occurs — be it within the system, the local bureaucracy, the school, the classroom, or the individual — require a more complex combination of methods. Though the pressures of development may force the project leader toward the one-dimensional (quantitative) analysis of only one or two aspects of the project (achievement and perhaps cost), many other data can also be gathered.

For one, quantitative censuses and surveys can provide baseline data on community conditions and family lifestyles. The collection of secondary or archival data from offices and schools can provide information on absenteeism, dropout rates, repetition, etc. And questionnaires and interviews, both closed and open-ended, can gather from parents, principals, and teachers their perceptions of what changes have occurred in educational processes and results and, more importantly perhaps, their opinions of such changes. Do they like their new roles, the use of new record-keeping procedures, the new structure and climate of their classrooms? Do they think the system works better for some pupils than for others, for mathematics than for language?

Observation schedules, both structured and unstructured, are a means to determine what actually occurs in classrooms. These can be quite quantitative in nature — counting frequencies of behaviours and interactions or the percentage of time spent "on task" or in various kinds of learning situations. They can also be more descriptive or qualitative through the systematic recording of how the system is being implemented and details of the new interactions being introduced into the classroom and school — microstudies, in other words, of critical aspects of self-teaching.

Descriptive, qualitative methods can also be used beyond the confines of the classroom as a basis for an ethnographic monograph on school, community, and system. Such a monograph — on one or two sites, perhaps — can examine in somewhat broader terms how the project has affected the running of the schools, its relations with the surrounding community, and its "fit" with the surrounding culture. Eventually such a monograph can also examine the problems faced by the project as it is disseminated through and integrated into the larger educational system.

Finally, to complete the list of methods useful in designing research and evaluation for innovations such as Impact, the setting up of the more classical experimental-control group comparison may also be

necessary though such a method can be fraught with difficulties in nonlaboratory conditions. What is important in any such controlled comparison is not only to measure the outcomes in terms of achievement and attitudes of both groups but also to gather data on classroom interactions and teaching methods. Such data will enrich the analysis of why differences do or do not appear between the experimental and control classrooms.

CONCLUSIONS

What might be done, therefore, to resolve some of the inevitable tension between research and development? Much of this tension can probably not be resolved; it is part of the order of things between developer and researcher, ministry official and academic. And some of it may, in fact, be creative, pushing the researcher toward seeking information useful to the immediate improvement of the project and the developer toward considering issues beyond a narrow definition of one project's success.

To the extent that some of this tension, however, should be resolved:

- A more systematic design for research and evaluation should be made from the beginning of the development process so that the project staff realize what kinds of questions should be asked and answered at different stages of development by different kinds of research and evaluation methods. Such a design must be flexible but not be neglected.
- From the very beginning of the project, its own development should be systematically noted and described: the context in which it grows, the assumptions upon which it is based, the evolution of its goals, and the implementation of its various curricular and management changes. Occasional, sporadic monitoring of the system as it is developed, is put in place, and begins to work is not enough.
- Because in the long run it may be both politically necessary and scientifically important for project personnel to be able to assess outcomes other than those of reduced cost and increased test scores, more attention should be paid to examining both the critical processes of interaction that characterize self-teaching systems and the noncognitive outcomes that might be expected to result from these processes. Especially important in this regard is the question of whether (and how) the system works best for a particular kind of pupil or teacher.

The rather complex research and evaluation needs described above can only be fulfilled if different strategies and different methods are used in the course of the project's development and implementation. Archival data and classroom observation, classical experiments and ethnographic monographs, censuses and achievement tests all have their necessary place in such evaluation.

Finally, this use of complex, multiple measures to examine the complex processes and multiple outcomes of self-teaching systems such as those described here can succeed only if project developers and policymakers resist the temptation to neglect research in the develop-

ment process. Although the pressures to move on with the development of modules and guides and the use of cognitive tests and costing formulas are great, there are other responsibilities just as great for the comprehensive documentation and analysis of the project development process — responsibilities to the project itself, to be able to improve it systematically based on carefully collected data; to policymakers and donors, to be able to explain why a certain outcome of their investment did or did not work; to project developers elsewhere in the world, to prevent them from rediscovering what has already been learned; to researchers examining the more theoretical and academic issues of self-teaching.

Fulfilling these responsibilities may mean the use of a full-time researcher or research team not distracted by the exigencies of daily project development, the recruiting of university researchers and advanced graduate students to work on these issues quite apart from the development team, or more funds for research from government and donor agency sources alike. The important thing is to start early enough to consider the alternatives so that the inevitable tension between research and development can be reduced to manageable and even useful proportions.

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